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EDITORIAL NOTES.

The Royal Commission on Coal Supplies.

As we were able to announce in our last issue, the Government have at length appointed a Royal Commission to inquire into the question of the coal resources of the country. So deliberate has been the action of the authorities in this matter, which was pressed upon their notice during the session of 1900 (though not so effectively as it might have been), that the announcement has taken the general public somewhat by surprise. The "man in the street" has so many and so varied topics brought to his notice daily, and his mind—even when he has one capable of taking an intelligent interest in matters concerning which he is, in the nature of things, yet more ignorant than those who profess to instruct him—is so bewildered by the rapid changes of the kaleidoscope, that it is impossible for him to maintain a more than nine days' interest in any subject. Otherwise, the sharp lesson as to the importance of an adequate supply of cheap coal brought home to every householder and trader in the kingdom in 1900 would not only have prepared the public mind for the appointment of a Coal Commission, but would have led to impatience at the delay that has occurred in the institution of an inquiry.

A generation has passed since the Commission over which the Duke of Argyll presided commenced its labours, which extended over five years, and culminated in the voluminous report of 1871. That report was, at the time of its publication, practically exhaustive. What fresh circumstances have arisen to justify the appointment of a second Commission? Several—and sufficient. The question of the export trade in coal has acquired a far greater importance than it possessed thirty years ago, and has been raised very practically and definitely by the imposition of a duty, at present limited to 1s. per ton, upon coal sold to consumers outside the kingdom. The Commissioners, in their estimates of the probable duration of our coal resources, calculated that the exports of coal would not increase, but would average annually 12 million tons. In the year 1900, the total shipments were, in round numbers, 58 million tons. For the thirty-two years, 1870 to 1901 inclusive, the Commissioners put down our exports at 384 million tons. They actually amounted to 995 million tons. Those figures do not need elaboration to prove the greater importance attaching to the question of exports to-day as compared with thirty years ago. The terms of reference to the newly-appointed Commissioners require them to consider this subject in its relation to the greater one of the home supply and its probable duration, and to the needs of the British Navy.

The importance of the possession of an adequate supply of best coal for the use of the nation's ships of war is another question that is now more pressing than it was in 1871; for since that year not only has our own Navy increased enormously, but the navies of the world have so developed as to make it more than ever necessary that British ships should be many and efficient. Without the best smokeless coal, that efficiency cannot, at present, be maintained. We say "at present" advisedly; for the possibility of mineral oil superseding coal as the fuel for steamships must not be overlooked. The Commissioners are, in fact, instructed not to overlook this point; being required to have regard to possible economies in the use of coal "by the substitution "of other fuel, or the adoption of other kinds of power." The second possible means of economy embraces, of course, the extended use for power purposes of electricity, of Mond gas, of blast-furnace or coke-oven gas, and of coal gas. The terms of reference do not, curiously enough, actually provide for, but the Commissioners will doubtless undertake, an inquiry into the possible economies in the use of coal itself as a fuel—that is to say, by the adoption of improved furnaces, grates, stoves, or other apparatus for the consumption of coal. Every possible economy in the direct or indirect use of coal ought, and was doubtless intended, to be made the subject of inquiry.

Another fresh fact that has come within the range of the coal question in England in recent times is the competition of America, including both the United States and Canada. Both of these countries threaten our foreign coal markets; and the possible extent of their inroads into these markets, and its effect upon our home supply, will naturally receive the attention of the Commission. But foreign competition in goods other than coal (which was an inconsiderable matter in the middle of the last century) has an even more important, though a less direct, bearing upon the question of our coal resources. That competition is especially keen, and is being directed against us by numerous competitors—Germany, Belgium, the United States, and (in the future more than in the present) Canada—in regard to the iron and steel trades. And the foundation of our own and our competitors' iron and steel trade is cheap coal. Dear coal brought to an abrupt close in the first half of 1900 one of the most prosperous periods of trade ever enjoyed by British manufacturers, and did enormous injury to many industries; and it is obvious that any permanent material increase in the cost of coal in this country and not in others would be a very serious blow to our commerce.

The most important point of all to be considered by the Commission is, indeed, that of how long our cheap coal is likely to last. That includes, of course, the question of how the means of production can be improved (especially as regards working at great depths) so as to increase the proportion of our coal stock that can be deemed cheap. The Commissioners are to inquire into the possibility of a reduction in the cost of coal to the consumer by: (1) Cheaper transport (the Chairman of the Great Northern Railway is Chairman of the Commission, and another member is Sir G. J. Armytage, Chairman of the Lancashire and Yorkshire Railway); (2) the avoidance of unnecessary waste in working. The first suggested opening for economy raises the question of improved methods of handling coal, and also of the wisdom of increasing the capacity and improving the construction of coal-waggons. The second involves an inquiry into the possibility of better methods of working, and of the use of machinery in place of hand labour—a question not considered by the Commission of 1866-71—and into the customary terms and provisions of mineral leases. These frequently necessitate the lessees working only the best seams, to the neglect of the less profitable ones, which it is afterwards practically impossible to work.

The reference to the Commission ends by requiring a report as to "whether the mining industry of the country, "under existing conditions, is maintaining its competitive "power with the coalfields of other countries." This is a comprehensive clause that can be held to cover practically every branch of the subject, and will, we hope, be deemed to include an inquiry into the labour aspect of the coal question. The increased cost of producing coal, due to higher rates of wages and the lower individual output, is a matter that calls for serious consideration. The labours of the Commission (the composition of which is excellent) will doubtless be protracted and very heavy. Its report will be awaited with the greatest interest, and by none more than those engaged in an industry to which the question of coal supply is *de vitâ et sanguine*.

Concerning the Coventry and Some Other Appointments.

THE retirement of Mr. George Winstanley from the position of Engineer and Manager of the Coventry Corporation gas undertaking, which he has held, in the words of Alderman Andrews, "with distinguished ability and success for the "last sixteen years," makes a convenient occasion for discussing, in the light of pertinent facts, the subject of the relations that exist, or should exist, between functionaries of so much local importance and the local authorities by whom they are employed and paid. Into the details of the rupture between Mr. Winstanley and his Committee it is not our place to enter; nor would the inquiry reveal anything of public interest. It is important to remark that Mr. Winstanley has an agreement with the Corporation, which expires on June 30 next, the requirements of which he has "strictly observed" (on the authority of Alderman Andrews,

again). It seemed good to the Committee, however, acting upon their unquestionable right, that on the termination of this agreement another should be framed under which (among other provisions) Mr. Winstanley, as Engineer and Manager of the gas undertaking, should bind himself to devote his whole time to the service of the Corporation. Whatever may be thought of the wisdom of this stipulation, either generally or in the well-known particular circumstances, it was open to the Corporation to make it in a fresh agreement, as it was for Mr. Winstanley to take his own course in the circumstances.

After deliberation, Mr. Winstanley decided to form his private business into a limited Company, and continue in the service of the Corporation, to which he would thus be able to give his whole time without destroying the interests and benefits he had created when specifically free to employ his skill and energy in this way. This proposal did not satisfy the majority of the Town Council, who thought they would prefer to have a Gas Manager without other business connections whatever. Obviously, this decision shut out Mr. Winstanley as completely as if he had been named as ineligible for reappointment; and, naturally, the next step to be taken was to draw up the fresh conditions for the new appointment, on the tacit understanding that Mr. Winstanley was left out of consideration. With this stage of the proceedings of the Coventry Corporation, therefore, the personal question as affecting Mr. Winstanley disappeared. We are not going to judge between the Corporation and their Gas Engineer. The record stands; and on his part there has been nothing to blame or deplore.

The conditions under which the new Coventry Gas Engineer and Manager is to be appointed were given in a paragraph in the last issue of the "JOURNAL;" and it is only necessary to add that they have now been adopted unchanged by the Town Council in special meeting. The chief provisions are, of course, the amount of the salary, and the nature of the duties to be done for it. We must admit at once that there is very little to find fault with, and much to commend. The figure, £600 a year, is adequate as a commencing salary, for a gas undertaking such as that of Coventry, with an output of about 600 millions annually. It ought not to be the limit; for the business is a growing one, and it is always a mistake on the part of employers to remove from any salaried officer the hope of better pay. It is asking too much of human nature to expect work to be progressive without the prospect of reward for faithful performance of the increasing task. The Coventry Manager will be the Engineer also—as is quite proper for a position of this grade. It is most satisfactory to observe that he will be the General Manager of the business and the office as well; and will consequently hold a position of independence of secretarial interference, which many a Resident Engineer will envy. The whole responsibility for the conduct of the undertaking—engineering, industrial, commercial—will rest upon the shoulders of the Engineer and Manager, which is the condition recognized by the first authorities as the most favourable for the production of the best results.

In looking through the detail conditions, it will assist the understanding to remember that the Coventry gas undertaking has a peculiar history. It was originally managed as a business by the Robinson firm, who also had leases of the works at Leicester, Leamington, and Nuneaton. The tradition of the Coventry gas undertaking is therefore more commercial than anything else—a very important qualification, and one that distinguishes the concern from those in which the tradition is only of red-tape and officialism. The question of the wisdom of requiring a gas engineer and manager of works "to devote his whole time to the duties of "the office," as the familiar phrase runs, is always a debateable one, in the interest of the employers, and is specially open as regards a position with so marked a business tradition as that of Coventry. The Coventry Gas Manager was, once upon a time, likewise a tar distiller on his own account, and had the gas-fittings trade in the town. That was an exception, and belonged to an era of development of the gas industry which has passed away. Those who are interested in any capacity in the British gas industry, however, should never forget the indebtedness of the industry at large to the old order of gas-works lessees—coupling with the reference the names of Robinson and Croll—for their having kept to the front the essentially commercial character of the gas business, in an age when statutory protection was beginning to lull Boards of Directors and officers into dreams of automatic dividend gathering, and of the sufficiency of "red-tape" to take the place of brains and enterprise in gas-works administration. This dream is still being dreamt in places.

We are not sure that there is not plenty of work in the British gas industry for a new Croll or a younger Robinson; but no such wielder of the broom for the sweeping out of cobwebby gas offices is in evidence just now; nor do they particularly want him in Coventry. As regards design and the more responsible kinds of expert work, there is something more to be said than the Coventry Corporation seem to know. There is such a thing as a "golden mean" in this matter. Perhaps the right view of the subject of the taking of outside work by a salaried officer is best perceived in the terms of the invitations recently issued by a certain University for applications for professorships in the Institution. We quote from memory; but the gist of the statements was, that the holders of the chairs of such living sciences as Engineering, Electricity, Mining, and Metallurgy, would be permitted to engage in the higher branches of expert work in their particular lines, "in order that they might "keep in touch with current practice." This is the point. It is assuredly not meet for well-paid officers to go about "black-legging," and spend their time and energies in doing "consulting" work which other men could do equally well. That is the abuse. The good and the proper use is for those constructors and works managers who are conspicuously successful in their own sphere, to be allowed to extend a helping hand to other concerns in want of such assistance as they can give, not only without injuring anybody, but incidentally to the advancement of their own skill and the ripening of their experience. Surely, the more and more varied experience an able man can get in ten years, the better the work he will do at the end of the period. And whether is it better, for him to have to build one new retort-house, and reconstruct another, in this lapse of time, or to sharpen his wits upon some half-dozen designs of the same kind? Of course, there are degrees. There is also a measure for all things. Glancing over the names of all the engineers who have done the best work for their employers, regular and occasional, and have rendered the community the most valuable service in improving the science and the practice of their speciality, one perceives that they have without exception had more or less free hands for the cultivation of their gifts; while the routineers, the recluses, the devoted souls who have never been allowed to go beyond the scope of a watch-dog's tether from their office doors—well, they have kept from troubling their Committees and Boards. But where would the gas industry be to-day, if all technicians had been like unto them? This idea of tying up the holders of important appointments to their desks may be the correct treatment for town clerks and town surveyors, whose work is altogether of a routine character; but in respect of work of a progressive nature, in the hands of a master, it is a mistake.

Mr. Livesey and the Crisis in British Industry.

IN another part of the present issue of the "JOURNAL" will be found the contribution of Mr. Livesey to the controversy that is still in progress in "The Times" concerning the habitudes of the British workman, "*var.* Trade Unionist," as a naturalist would distinguish him. Our collection of newspaper cuttings relating to this matter still grows. But nobody has deemed it worth while to state, if he happens to know, what it cost in time and money to lay a rod of brickwork in 1850 and 1900. Every gas manager who reads his "JOURNAL" might be a "Gallio" in these respects, for all the pains he takes to supply facts. How, in the name of all that is reasonable, do employers of labour think that what they are ready enough to declaim against as the excesses of Trade Unionism are to be reduced, if they themselves will not even put themselves to the trouble to furnish proofs of such excesses? Mr. Livesey is a man who takes no interest in generalities. He has made his name, and served his cause, by strict adherence to facts and figures. It is a very simple prescription; but how few believe in it? Ten—perhaps a hundred persons, will say that this or that thing is "monstrous," "unprecedented," "extravagant," or what not, for one who is prepared with hard facts and figures in support of his words. The whole difference between the "responsible" and "irresponsible" critic or witness, is not that the former is willing to give his name or even make oath to the truth of what he says, but that he is prepared to prove it under cross-examination.

There can be no question that Socialistic Trade Unionism

stands convicted, out of the mouths of its own prophets, of adhesion to the fallacy of adjusting output to some artificial and self-regarding standard of what is expedient. This, and no other, was the logical justification of the men of the "eight-hour day" movement. These men had their reason, which was the absorption of the unemployed. Failing the overt concession of the shortened period of labour, they thought it possibly easier to attain the same end by restricting the amount of work done in whatever the nominal duration of the working time. They carried on the campaign further by insisting upon the "one man, one job," principle. The coal-wheeler must not take a broom in his hand; the gas-stoker must not oil the screw of a retort-lid fastening. To waste an employers' goods was nothing—why should the wage-earner go out of his way to check a water-tap that overflowed? It was none of his business.

The true measure of Mr. Livesey's service to British industry consists in his bold, and apparently reckless, economic surgery, which cut through all conventions to the root of wage-paid disaffection to the rulers of things as they were in the industrial world. He saw that the source and origin of the sickness of the wage-earner—and the salary-earner, too, for that matter, for there is no difference here—lay in the absence of hope of improvement in the lot of the mere employee. Why else should a wage-earner, even when well paid and considerately treated, listen to the interested rigmarole of the street-corner orator? Where could he have learnt anything truer, or better? The champagne-drinking "strike organizer" is a blacker reproach to the employer and the social system he represents, than to the poor deluded workman whose money he takes while it is going. If the work of education were better done, the State-taught populace would find no charm in Battersea translations of German Collectivist doctrines; and if the employer-class understood their opportunity, and welcomed prosperity-spreading devices as heartily as labour-saving machines, their conventional leadership would be confirmed upon them.

The Case against Municipalism.

It is a piece of proverbial philosophy that if habitual criminals are but granted a sufficiency of rope, they will surely hang themselves in due time. Though the analogy is not on all-fours, the case of professed Municipalizers "on principle" is susceptible of being illuminated by it. The further the craze for Municipalization is carried, the quicker and more convincing will be the reaction against this forcing upon public bodies of responsibilities which they were never intended to bear. There has lately been a tremendous storm in the very small teacups of the journalistic organs of Municipalism, over the flat refusal of the Middlesex County Council to go into tramways management. The London County Council are so conspicuously addicted to intermeddling with anything and everything of the kind, that it was quite refreshing to find, in the Middlesex County Council, a body of gentlemen calmly convinced of the wisdom of leaving business affairs to business men. It would have been a good thing for the ratepayers of many urban districts if their elected representatives had always been of the same prudent way of thinking. Yet, so wonderful a power is prejudice, some of the most headstrong partisans of Municipal Trading cannot or will not see the force of any evidence to this effect that may transpire. Take the record of West Bromwich, for instance, which seems to have awakened somewhat tardily to a sense of the gravity of the Corporation commitments in the way of loans.

The West Bromwich Town Council have adopted a resolution declaring that they regard with concern the continued increase of expenditure, and are of opinion that the time has arrived when the finances of the borough should receive great care and attention. This is all very well so far as it goes; but, like most people who find their money running away faster than they quite approve of, the Council were plainly at a loss for some method of giving practical effect to their abstract desire for thrift. They descended on the somewhat feeble recommendation that copies of Committee reports should be in the hands of members of the Council for seven clear days where there was a proposal to expend a sum of £200 or upwards. This is, of course, a detail. Many local authorities have standing orders requiring the postponement, over a definite interval, of motions involving relatively large expense; but it has never been proved that a penny was saved in consequence. The curious comment offered on the suggestion by a professed advocate of Municipalization was, that instances are not lacking of councillors who have been given an even longer period of grace, only to show by their subsequent speeches at council meetings that they were entirely ignorant of what the Committees had done! Very likely; but is this a good reason why bodies so constituted should be entrusted with industrial and commercial enterprises?

The truth of this matter is evidently of another colour. Municipalities are not the only bodies who fail to do properly what ought never to be laid upon them. There is a perfectly natural and reasonable reluctance on the part of prudent men to associate themselves with organizations in connection with which they might find themselves committed to all sorts of unexpected enterprises. Most of the failures of united effort in the history of civilization are traceable to the rise of a rash ambition to undertake offices outside the original and proper scope of the organization, whatever it was—church, trading company, or guild. Unless the far-sighted members and well-wishers of the reformed local governments of the United Kingdom see to it, these institutions will lose credit, and fall into disgrace, from the same cause. As time goes on, the best men for the work of local government will avoid it, for the reason that they cannot spare the time necessary to be given up to the committee engagements; and power will fall more and more into the hands of those who will wield it—for a consideration. The wirepuller of a trade union, the nominee of a contractor, gets into a local authority unopposed; the man of affairs resigns, and his fellow outside does not seek election. This is one of the aspects of Municipalism which began by hiding itself from view; but it is fast coming into focus, to the exclusion of others. The next few sessions of Parliament will witness the consolidation of the divers local elective bodies which at present appeal unequally to the suffrages of perplexed ratepayers; and Town Councillors, Guardians of the Poor, and School Boards will form one group of the Great Unpaid. Such public supply undertakings as must needs be carried on by and for the public whom they serve, will be administered independently by Joint Boards, or Commissions, who will be relieved of the temptation to cook the accounts, or squeeze profits out of helpless consumers, which besets municipal committees.

Such is the nature of the ground on which the abuse of Municipalism will have to be fought. No weight attaches to the interested attacks on the principle of those persons who desire to keep such businesses as that of electric tramcar working in their own hands, or who have other axes of their own to grind. They may be a set-off to the Trade Union alderman, and other peculiar busybodies who contrive to live, nobody knows how, while devoting all their time to "public duties." But the issue does not depend upon any such private and personal considerations as these cases suggest. It is a question of what are, and what are not, the proper and sufficient duties and responsibilities of local self-government. There is a quite clear separation between government and trade; and it will be the care of wise statesmanship in the immediate future to see that this line is very much better kept than it has always been in the recent past.

The Welsbach Directorate.

Among the many points which the shareholders of the Welsbach Company are invited by their Advisory Committee to consider, is that of calling upon the present Board to retire. From the beginning, the directorate of the Company has been a transient body. Every change in the affairs of the concern, every conversion, and every amalgamation, has, we seem to remember, brought fresh faces to the Board, and those faces to which the shareholders were about getting accustomed vanished. Then divisions of opinion on questions of policy brought resignations just before the last annual meeting; and there was one enforced retirement through the same cause. The remaining Directors took the opportunity, when appearing before the shareholders at that meeting, of getting them to assent to a reduction of the Board to five. The five were Sir Henry Burdett (Chairman), Lieut.-Col. W. Treslove Ellis, Mr. L. R. de Fonblanque, Mr. James Head, and Mr. Frederick Clark. Mr. Head only joined the Board in 1900; and Mr. Clark was co-opted by the Directors as a coadjutor in place of the gentleman who was unsubmissive to his colleagues, and with whom, Sir Henry Burdett stated, they could not work amicably. And now the shareholders are advised to shift the reins of authority from the present Board on the ground that, "in view of past dissensions and errors,"

they are "incapable of conducting the affairs of the Company "with success." The shareholders will learn with mingled feelings that their distasteful task of pronouncing upon this personal question is being somewhat lightened. As the Advisory Committee stated, Mr. Head has already signified his intention of retiring, and now we learn that Lieut.-Col. Ellis died on the 27th ult.—after an attack of acute pneumonia. He was only in his 59th year. Apart from his fitness or otherwise to serve them as a Director, the shareholders will hear of his loss with sorrow.

Those who Remain.

Three Directors are thus left to be dealt with. Sir Henry Burdett does not intend to cry *peccavi* before the shareholders. He has an honoured reputation in the City; but we do not know that he has had any great experience—other than in the Welsbach Company—as a Director. His presence has hitherto inspired confidence; and he is persuasive in his oratorical style. The shareholders will have to choose between Sir Henry, and Sir Henry alone, and the Advisory Committee. Mr. De Fonblanque occupies a curious position. He was the Secretary of the old Company in its days of extreme poverty. Then later, when fortune seemed to be smiling on the concern, he was raised to the more dignified position of Director; and he still holds his seat now that the concern is over-weighted with that which it formerly lacked. Mr. Frederick Clark is the latest addition to the Board; and of him we know little. Anyway, he can hardly, being a member of only a few months' standing, be reckoned among those responsible for what the Advisory Committee describe as "past dissensions and errors." However, the position of the sitting members of the Board is extremely interesting. They have issued their reply to the Committee's report; and a meeting of the shareholders has been called for the 15th inst. Some of the matters dealt with in the reply are commented upon elsewhere.

Permanency of Benzol Enrichment.

A question was raised as to the permanency of benzol enrichment of coal gas at the meeting of the Leeds City Council last Wednesday. One of the members remarked that there had been general complaints as to the low illuminating power. His contention was that the benzol was effective in enriching the gas for a certain distance; but when it had travelled beyond a given point, the benefit was lost. He suggested that the Committee should purchase a portable photometer, and make their own tests. The Chairman of the Gas Committee (Alderman Lowden) admitted that there was need for investigation, and said he had doubts whether the benzol enrichment would be permanent. A small Committee have been appointed to take the matter in hand; and we trust their labours may throw additional light on a question which, in view of the increase in the use of benzol for raising the illuminating power of gas, is of considerable importance. With regard to the suggestion that the Committee should make their own tests by a portable photometer, Alderman Lowden said he had received authority to purchase an instrument; but the seller had informed him that he could not guarantee the results. The photometer was reliable; but the conditions under which it would be used were so various that they could not rely on the tests. We commend this statement to the attention of the London County Council and their advisers.

The Committee's Opportunity.

The Committee who have been appointed (as mentioned above) to consider the question of the permanency of benzol enrichment have a grand opportunity of conferring considerable benefit upon the gas industry at large if they will only rise to the occasion. We do not know of a better place than Leeds, with its long stretches of different sized mains, for testing the travelling capabilities of benzol; but the investigation should be taken up in a thorough manner, if any real advantage is to accrue. First of all, some inquiry should be made as to experience at other places. There are several works in Lancashire and Yorkshire at which benzol enrichment is carried on; and a knowledge of the experience at such works might supply the Committee with suggestions as to some of the lines they should adopt in pursuing the inquiry. Of course, the general lines are obvious. One great difficulty in dealing with a matter like this is the want of properly equipped testing-stations at distances from the works; and this is clearly recognized by the Gas Committee. But if they will only rise to a scientific investigation, means could, at little expense, be found to make tests in different parts of the district fairly comparable. The means used at at a distance must, however, be the same as those employed at the point of emission of the gas from the works. We do not approve of the portable photometer as an instrument of the law; but if the conditions under which it is used are made so that they are approximately comparative, then some valuable scientific evidence on this question of enrichment might be gathered in. We would suggest, for instance, that the gas should be tapped direct from the mains by a special service-pipe. The cost of doing this would not be great; but the result would be the more valuable and reliable. Then there are technical questions involved connected with the manufacture which could be brought into the scope of the inquiry. For example, there is the point as to which gas—that produced at high temperatures, or that produced at low temperatures—is the better capable of carrying benzol to a distance; or as to whether the question of temperature has any effect at all. Then, again, there is the question as to the best point for the addition of the benzol to the gas—whether before or after the condensers; and also as to whether storage in gasholders has any effect in depriving the gas of some of the advantage contributed to it by the benzol. Now if Mr. Lowden and his colleagues will only give Mr. R. H. Townsley *carte blanche* in instituting a full inquiry—a half-hearted one will not be of value to Leeds or anyone else—they will be rendering a service for which gas engineers will be extremely thankful. While the Committee are taking one step, they might as well take half-a-dozen, and produce something which will turn the eyes of the gas industry to Leeds.

The Gas Referees' Notification for 1902.

The Metropolitan Gas Referees have followed the precedent set by them last year, and have issued their "Instruc-"tions" for the current twelve months. This will obviate the half-yearly publication of these documents, which it may be assumed has been definitely abandoned. It is set forth that the illuminating power of the South Metropolitan Company's gas is to be 14 candles; no change, of course, being made in respect of the other two Companies. The maximum quantity of sulphur allowed in the summer months (April 1 to Sept. 30) is 17 grains, and in the other months 22 grains, per 100 cubic feet. The regulations with regard to ammonia and sulphuretted hydrogen are unchanged; but an addition has been made to Appendix D, relating to the testing-burner, consequent upon the alteration in illuminating power above referred to. In the South Metropolitan Gas Act, 1900, it was provided by section 6 that the burner for testing the gas supplied by them should be Sugg's "London" argand, as prescribed by section 38 of their Act of 1876; and that in making the test it was to be so used that the gas should be burnt at such a rate as would give a light equal to 16 candles. Then followed this proviso: "Provided "that when, under the provisions of this Act, the prescribed "illuminating power shall be 14 candles, the said burner "shall be used with the chimney prescribed by the Gas "Referees for an illuminating power of 14 candles." The Referees are advised that the chimney mentioned in the section is the one specified in their "Instructions" for the summer of 1876 and for several previous years, which contained a prescription to the effect that for testing the gas of the Imperial Gas Company and the South Metropolitan Gas Company, which was in each case required to have an illuminating power of 14 candles, the burner was to be Sugg's "London" argand No. 1; but it was to be "used "with a chimney 6 inches long by $1\frac{3}{4}$ inches diameter." These directions were followed by the proviso that "if at "any time the gas flame mounts above the top of the chim-"ney, a 6-inch by 2-inch chimney shall be substituted for "the 14-candle gas." The first-named chimney is presumably the one contemplated by the Directors of the Commercial Gas Company in clause 13 of their Bill for next session. Some textual and verbal alterations, necessitated, in part, by the lowering of the illuminating power of the South Metropolitan Company's gas, have been made in the "Notification;" and the table giving the illuminating power of gas as calculated from observations of the rate of consumption required to yield the light of 16 candles has been extended by the addition of eight lines at the top, so that it commences at 1 min. 32 sec. instead of 1 min. 40 sec.

A Smokeless London.

Dealing with this subject in the current number of "Cassier's Magazine," Mr. W. C. Popplewell considers that the solution of the smoke problem in London will not be brought about by legal proceedings, or in consequence of individual effort, but by the use of gaseous fuel and the more general adoption of electrical methods. He says the more gas is employed in living-rooms and for the culinary operations in houses, the less smoke there will be. This is perfectly self-evident; and we are at one with him on this point. When, however, he goes on to say that "the cost "of illuminating gas is too great to permit its general "adoption," we are inclined to doubt whether he has a just appreciation of what a pennyworth of gas will do. He thinks that if the gas companies would provide "a second "supply of gas suitable for heating purposes alone," its greatly reduced price would give an impetus to the use of gaseous fuel, and a way be opened towards the lessening of the smoke. Mr. Popplewell says such a fuel could be made very cheaply; but what about its distribution? However, as he looks forward to a not remote time when illuminating gas will be superseded by electricity, he thinks the gas companies would do well to adapt their plant to the production of heating gas, to be distributed in the old pipes, which would otherwise be rendered useless, instead of abandoning them as so much scrap-iron. Mr. Popplewell acknowledges that his idea may be Utopian; but he cites the progress of electric lighting during recent years in support of his suggestion that in the not distant future it will entirely eclipse the older illuminant. He also looks forward to the electrical distribution of power from central stations as another means whereby the atmosphere of London will be purified.

New Gas-Works Scheme for Paris.

The circumstances under which the consumers of gas in Paris have to pay twice as much for this commodity as those who have the good fortune to be supplied by the London Gas Companies, have been frequently discussed in the "JOURNAL;" and our readers are therefore aware that various movements have been set on foot from time to time to obtain some reduction in the very high figure of 30 c. per cubic metre, which is equivalent to 6s. 9½d. per 1000 cubic feet, which is now charged. The problem has been attacked, but without appreciable effect, by several Commissions, any change being difficult during the continuance of the Gas Company's concession. Its approaching expiration, however, has led to a re-opening of the whole question, and, as our readers are aware, the appointment of another Technical Commission, who have the matter in hand. One of the members of this body is M. Lauriol, the Chief Engineer of the lighting service of the city, who has studied the subject in all its phases. The result of his labours is a most voluminous report, of which an abstract translation appears elsewhere. He has furnished to his colleagues and to the Municipality a scheme for new gas-works, each of a daily capacity of 17½ million cubic feet, in three of the Paris suburbs, with auxiliary water-gas plant of like capacity to be annexed to the existing works. It is unnecessary to do more here than direct attention to the report, which, we are sure, will be perused with interest.

The Clamond Radiator—A Suggestion.

While watching the operation of the Clamond gas radiator (which by the way has taken the fancy of a lot of visitors to the Crystal Palace Gas Exhibition), we were struck by what seems to be a little error in construction. In the larger types —those with ten fire-clay tubes—a most convenient arrangement is the double system of feed to the burners, whereby, when a room is sufficiently heated, half the tubes may be shut off completely. As the large stoves are now made, this is done by turning off five of the burners all on one side, which results in one side of the stove, or five tubes, being perfectly incandescent and the other side quite dead and cold in appearance. Such an arrangement scandalizes the sensitive eye, and shocks those persons who have a liking for a proper disposition of, and a balance between, parts. Now we suggest that by a little re-arrangement of the feed-pipes, two or three of the tubes on both sides could be turned off from one tap when less heat was required; leaving incandescent the central four or six (as the case may be). This would serve the very convenient purpose intended by the makers, and would at the same time meet the views of those people whose susceptibilities in regard to preciseness of appearance are quickly offended.

The Welsbach Company and the Ironmongery Trade.

A correspondent of the "Ironmonger" has called attention to the paragraph in the report of the Advisory Committee of the Welsbach Gas-Light Company in which they express the opinion that the Company should co-operate with the great gas companies, "whose interests," they say, "are essentially bound up with their own." The writer considers the arrangement would suit the gas companies, but not the retail ironmongers, plumbers, or gas-fitters, of which the Welsbach Company have some thousands as customers upon their books. He thinks the shareholders will hesitate before they throw over those who, in the early days of incandescent gas lighting, helped so greatly to build up the trade of the Company. In an editorial comment upon the letter, our contemporary expresses the opinion that the Company would be very foolish to "make enemies of "the ironmongers for the sake of the gas companies," and believes that terms will be offered to private traders which will make it possible for them to "continue to take an "interest in the sale of the Welsbach goods."

WATER AFFAIRS.

The Outlook.

IN a very few days the second Parliament of His Majesty King Edward the Seventh will be in session, and the nation will know something definite about the measures which the Government intend to introduce. Whatever may be the other schemes of legislation foreshadowed in the King's Speech, it may be regarded as tolerably certain that one, at all events, will be the promised project for the constitution of a Water Board for London. It appears, therefore, as though a question which has been more or less under discussion in the Metropolis ever since the Duke of Richmond's Commission reported, some thirty years ago, in favour of the consolidation and public control of the water undertakings, is now in a fair way for settlement. But one must not be deceived by appearances. The promises made by the President of the Local Government Board were one thing; his performances may be quite another—indeed, there has been good reason for supposing they will be. Mr. Long, however, has publicly stated his belief that, while the proposals of the Government may possibly not be regarded as meeting all requirements, they will be considered by Parliament as an honest attempt to act justly to all parties concerned. How far this belief will be shared by the Water Companies it will be impossible to say until the Bill embodying his scheme has been introduced. The composition of the proposed Board, as briefly indicated in the "Gazette" notice, has already evoked adverse criticism; and therefore it is to be hoped that in this and other respects the Government scheme will have undergone some modification before it is submitted to public scrutiny.

Apart from the special projects relating to water supply to come before Parliament next session, of which an indication was given in the "JOURNAL" a few weeks ago, and which will be more fully noticed in the course of the series of articles commenced to-day, other matters of general interest to those who have the control of water undertakings will, it may be pretty confidently expected, be submitted for the consideration of the Legislature. First in importance stands the Bill framed some time ago by the County Councils Association to sanction the constitution of Water Authorities armed with powers for the protection of the water supply within their respective areas. The draft of this measure has been all over the country, and has been generally approved. It provides that, upon representation being made to the Local Government Board, by any County or Borough Council, that a Water Authority for the district would be of local and public advantage, the Board may, after inquiry, constitute such authority by Provisional Order. It is proposed to confer upon it power to promote and oppose Bills, prevent the pollution of rivers and the depletion of springs and wells by pumping for colliery purposes, and compel water suppliers within their area to keep records of the effect of pumping water for sale; but it is not to carry out works or undertake the distribution of water. It will be mainly a supervisory body. Another matter on

which it may be expected some definite action will be taken will be the amendment of the law relating to the rating of reservoirs. The Association formed with this object, which is composed of representatives of Sunbury and various other towns in the Thames Valley, has shown signs of being very much alive; and as the present basis of one-fourth of the full rateable value is strongly condemned in the district as "one "of the most iniquitous systems that ever prevailed in this "country," it is not surprising to find that the movement is receiving a good deal of support. It is, in fact, receiving the support of Sir F. Dixon-Hartland, M.P., who is reported to be taking steps to obtain the insertion in the Government Water Bill of a clause to carry out the object of the Association. In addition to these matters, we may expect the subject of the pollution of rivers to come up again in the Bill which has now become a parliamentary hardy annual. Finally, Sir Blundell Maple's Water Bill for the Metropolis may be revived, and Mr. Sinclair's dropped Bill of last session to amend the law relating to the liability of Companies for the storage of water re-introduced. Altogether, therefore, the approaching session promises to be an interesting one.

Underground Water Rights.

It has been mentioned above that one of the objects of the Bill of the County Councils Association is to prevent the depletion of wells by pumping. When referring thereto, we were reminded of a decision of the Court of Final Jurisdiction of the State of New York which it may be of interest to record. It was to the effect that the pumping of underground water from the land of another, by means of wells or otherwise, was a trespass. The question came before the Court under the following circumstances: The surface water supply of Brooklyn had for some years been inadequate; and a number of wells were constructed by the City of New York, and equipped with the necessary pumping plant, to furnish the additional supply from underground sources. The plaintiff in the case alleged that he had been injuriously affected by the pumping operations, and an injunction was granted restraining the city from continuing them, and awarding $6000 as compensation. This decision led four market gardeners to claim damages, which certainly did not err on the score of inadequacy. The really interesting point in connection with the case was brought out by the evidence of Mr. Rudolph Hering. The water was pumped from a depth of 36 to 157 feet below the surface; and it was claimed that it caused the water-level to drop 8 feet, and exhaust the moisture from the soil. It was shown, however, by the engineering evidence, that this was impossible, inasmuch as the moisture did not depend upon the depth of water below the surface, but upon the rainfall. Besides, the plaintiffs went on year after year raising the same crops, though they knew, according to their testimony, that they would be ruined by the pumping. The Judge was far too 'cute to be led away by the grossly exaggerated estimates of the plaintiffs' losses, and he cut down the damages to a mere trifle in each case—remarking that the city and the ratepayers were entitled to be protected against such claims.

The next meeting of the Manchester and District Junior Gas Association, will be held on Saturday, and will take the form of a visit to the Rochdale Corporation Gas-Works. The members will meet at the Rochdale Station at 3 o'clock. The annual dinner of the Association will be held on the 8th prox.

A new contribution to the search for the typhoid bacillus has lately been made to the Paris Academy of Sciences by M. Cambier. In a note which appeared in the "Comptes Rendus" some time ago, the author showed that the typhoid bacillus could make its way fairly readily through the walls of a porcelain filter immersed in a nutrient broth. The *Bacillus coli communis*, which is also very mobile, can go through the walls in a similar manner. In the present paper, an account is given of an attempt to diminish the mobility of the latter bacillus by the addition of alkali and common salt. Particulars are given of an application of these facts to the determination of the presence of the typhoid bacillus in drinking water.

The injury to water-mains in St. Paul (Minn.) by electrolysis has become so great that a formal notice of the matter was lately sent to the street railway authorities. It was prepared by the City Attorney, and opened with a statement of the damage disclosed by a recent investigation of the condition of the pipes. The Board directed the Company to prevent any further damage, although it did not recommend any remedy, and gave notice that non-compliance would be followed by legal proceedings. Notice was also given to the Company that they would be held liable for all damage sustained by the water system of the city by reason of stray electric currents.

ESSAYS AND REVIEWS.

THE WELSBACH DIRECTORS, THE ADVISORY COMMITTEE, AND THE GAS INDUSTRY.

The four Directors of the Welsbach Company who are still in office have issued their reply to the report of the Advisory Committee; and considering the nature of the latter document, and the fact that it was only put into the hands of the Board and the shareholders three working days before the Christmas holidays, Sir Henry Burdett and his colleagues have not been laggard in dealing with it. These, we regret, are about the only complimentary words we can say for the reply, which must be as disappointing to the gas profession as it possibly could be. We have already declared ourselves generally in favour of the Advisory Committee's recommendations, and have done so from the intimate knowledge which we possess of the great possibilities, under favourable conditions, of incandescent gas lighting in this country. Therefore let the use of the term "disappointing" be not misunderstood. In view of the position we have taken up in this matter, a waggish person might construe the word quoted as an admission on our part that the Directors had disappointed us by succeeding in casting down the monumental load of condemnation of the administration which has, piece by piece, over several years, brought the Company to its present stricken state. Of course, we should disclaim such a humorous interpretation of our use of the word; the Directors reply being to us disappointing in that it discloses an utter paralysis of ability to grasp the levers which would shunt the concern on to the lines that would eventually have a salutary effect upon its fortunes, and would at the same time conduce to the advantage of that outside and innumerable section of the community whose goodwill the Company must obtain to realize an increment of success year after year—particularly after 1906 if they succeed in holding till then their patent claim.

Carefully worded phrases do not hide the fact that the Directors have tried to take the sting out of the Committee's report by endeavouring to disparage their labours. This is one of the weaknesses of the reply, and is not likely to strengthen the position of the Directors when they are *vis-à-vis* with the shareholders on the 15th inst. Seeing that the Board were largely responsible for bringing the Committee into existence at the last annual meeting, such an attitude comes with very bad grace from them. "So far," they say, "from advising, the Committee have only hampered the Board's work, and—perhaps unavoidably, but not the less certainly—have injured the interests of the shareholders, owing to the length of time necessarily occupied by their proceedings, and the consequent delay in the appointment of a General Manager to control the business." The construction of this sentence is lamentably self-condemnatory. We question entirely—looking to the future more than the present—the statement that the Committee "have injured the interests of the shareholders." The Directors seem to admit—unconsciously perhaps—an incapacity, with all their insinuated knowledge of this special business, to adequately direct it concurrently with an investigation of the kind that has taken place, and to do so for the space of six months or thereabouts without the aid of a General Manager, notwithstanding the large official staff which they possess at headquarters, and the fact that an official of many years' standing occupies a seat on the Board. The Directors acknowledge the necessity of the length of time occupied in the inquiry; and they must have had foreknowledge of the character and extent of the work which the Committee undertook, partly on the Board's invitation, at the meeting of the shareholders in June last. Therefore to now use the point, in a defence of their policy, that the interests of the shareholders have been injured owing to the length of time "necessarily" occupied, is merely raising a cloud of dust, is an exhibition of pique, and is, to say the least of it, a bit unbecoming on the part of those whose signatures are appended to the report. Again, the Directors say, it "is to be regretted that no member of the Committee has had any experience of a practical nature in gas enterprise." It would have been far better if the Directors had recognized this at the time the Committee were constituted on June 27, when the deficiency might have been remedied. The Board had—or at all events the Chairman had—previously considered the question of the appointment of the Committee; but no suggestion came from the chair as to the advisability of having a member with "experience of a practical nature in gas enterprise." The point to-day is certainly an ill-timed one. But those who now regret the absence of an experienced man, may tell us that they have learnt to be "wise after the event." In one part of the reply, they make use of that very convenient apothegm; but shareholders of this or any other concern are not always to be satisfied with such an evasion of responsibility for want of foresight on the part of those whom they appoint for the very purpose of guiding and guarding them and their interests. However, the Directors can hardly accuse us of being charlatans in the matter of gas enterprise; and with our knowledge of the present requirements of the gas industry, we can heartily support the findings of the Advisory Committee in so far as they will bring about the recommendations set forth

in paragraph 50 of their report, under the sub-heading of "Commercial Policy."

While, in one part of the reply, the Directors regret that no member of the Committee has had any experience of a practical nature in gas enterprise, and especially in incandescent lighting, in another part we find them referring to "the danger of entrusting a business of a technical character like that of the Welsbach Company to gentlemen having no experience or knowledge of incandescent matters." But we fail to discover anywhere in the reply that they suggest that a man of "practical" or "technical" experience in gas enterprise would be beneficial on the Board. Yet we strongly suspect that the absence of such a man on the directorate has had something to do with the Company being in its existing position. We believe the Directors in office to be honourable men to the extreme; and they cannot be held responsible for all that has brought the Company into its present state. Whether or not they are the best qualified for the positions they hold is quite another matter. Three out of the four have had a comparatively short tenure of office in the direction of the concern (and in speaking of the concern we include the original forms in which it existed as well as the present); but all four endorse in large measure, in their reply, the past policy of the directorate. However, we cannot find evidence that any one of the Directors has had "practical" or "technical" experience in gas enterprise. "Prior to November, 1897," Sir Henry Burdett had (he himself confesses) "no knowledge of, or interest of any kind in, the Incandescent Gas-Light Company, or any of its kindred enterprises." Mr. De Fonblanque was the Secretary of the Company in one of its original states; Mr. Head (who has given notice of retirement) we believe professes to know more of financial matters than of gas; and of Mr. Frederick Clark we can positively say that we have never heard of his name being previously associated with the practical side of gas enterprise. If the shareholders are wise—whether or not the present Directors are dethroned—they will see to it that, as counselled by the Advisory Committee in paragraph 46 of their report, the Board in future shall comprise a "representative of the gas-lighting interest," and let him be a man of practical experience.

We have laid ourselves open to the charge of having misappropriated (by not quoting the context) one phrase out of the report for the purposes of our argument. We accept the imputation; it being sufficient for us, whatever the reason, that the Directors now "regret" the absence on the Committee of a man practically experienced in gas enterprise. The reason for the regret is another matter; and we are called upon to deal with it separately, and more particularly than any other part of the reply. The reason is this that, had there been such a man on the Committee, they "would have known that experience has shown that the attitude of most gas companies to all forms of gas economizers has been one of either active or passive hostility." In so far as this statement refers to incandescent gas lighting, we wish to "nail it to the counter" as being absolutely false and void of truth. The fact is entirely the contrary. Fortified by the records of the "JOURNAL," we fearlessly challenge the Directors for proof; and we turn upon them the words which they themselves have applied to the Advisory Committee, and say that this statement "betrays a want of knowledge of the business." As we pointed out last week, the Advisory Committee prudently recommend a closer association of the Company with the gas industry, and (mark this in connection with the use of the word "mainly" in the following quoted sentence) the appointment of one representative of the gas industry on the Board of five members. Upon this the Directors say they "cannot too closely deprecate the suggestion that the Company should place its interests mainly, as they understand the Committee's recommendation, in the hands of the gas companies, who would neither push sales nor recommend mantles, except to increase the consumption and sale of gas in competition with the electric light, and then only on their own terms. The goodwill of the Welsbach business depends upon the goodwill and active co-operation of the gas trade, as distinct from the gas companies." By "gas trade" we understand the Directors to refer to the gas-fittings trade, as distinct from gas suppliers. Again we repudiate the Directors' assertion, which is sufficiently unworthy to have been ignored altogether were it not for the mischief which it may do in turning the shareholders aside from accepting one of the best pieces of advice tendered to them by the Advisory Committee. We cannot understand the Directors' attitude towards the gas industry, when it is upon the very prosperity of that industry that the prosperity of their own concern depends. Is it by setting up the backs of those who have the direction of that great industry that they can hope to achieve such a measure of success as will give contentment to shareholders who are at present without dividend, and whose investments stand, in the case of the ordinary shares, at a discount of nearly 90 per cent. in the market? The vision of the Directors must indeed be sadly cobwebbed. Who, we may fairly ask, has the greater and better opportunity of developing the use of incandescent gas lighting—the gas supplier, who has the right of entry into the house of every gas consumer, and the frequent chance of personal contact and conversation, or the tradesman whose shop and advertisement are the sole means of communication? Only the prejudiced, and those who do not know what gas suppliers have been doing, would give an answer contrary to our own. Throughout the reply of the Directors there is not a statement which is likely to have a more mischievous effect than the one with which we have just been dealing. The friendship of the gas industry is not a thing to be lightly despised by the Company, particularly if they have an eye to the future when free competition will offer to gas authorities the power of choosing from a variety of incandescent mantles, burners, and fittings. In making such an unjust charge against gas suppliers, the Directors have indeed shown to the world a faulty diplomacy.

In other parts of the reply, there is really little which will appease the yearnings of hungry shareholders, and there is no ground marked out on which they can build any hope while the present conditions are maintained. The Directors state that a profit was made in the "lean half" of last year—the six months ending September—of £11,328; and shareholders who like arithmetical exercises, may amuse themselves in working out the fraction of 1 per cent. which this sum represents on the $3\frac{1}{2}$ millions of capital. The Directors do not give any hint as to whether the sales have been good so far as the present half year has gone. This could have been easily ascertained by them. But there is a suggestive sentence in the section dealing with "Administrative and Selling Expenses." The Board there say they "fear that much evil may result from the Advisory Committee's report being issued during the best season of the year, and the effects on the business may, in consequence, prove very serious for a time." Whether or not this is intended to prepare the shareholders for a disappointing half year, we do not know; but it certainly gives one that idea. However, we do not think there is any real ground for the Directors' fear. Few gas consumers who want incandescent gas-fittings care a fig for the Welsbach Company's domestic troubles, besides which the larger part of gas consumers' requirements for incandescent fittings for the present lighting season were no doubt filled before it had half spent itself, and so before the Committee's report was issued.

In concluding their reply, the Directors define their line of policy; but from that or any other line of policy, the shareholders cannot expect now to gain much advantage before the expiration of the 1893 patent. Therefore, we hold that the more radical change in policy propounded by the Committee, with its recognition of a closer association with the gas industry, will prove in the end the more advantageous to the concern. In the suggestion that the gas industry shall be kept at arm's length, we find a serious defect in the Directors' plans for reform. They could not have taken a better course than they have done in the reply to alienate from the concern the sympathy of a powerful customer and ally. We sincerely hope that, in this connection, the shareholders will not be so foolish as to allow themselves to be ill-advised. Time is now too valuable to be lost; and the Company should at once set about cultivating friendship all round, in order that, when the struggle comes, as come it will, they will not be found unprepared.

AN ENGINEERING INDEX.

No one who has been engaged in any department of engineering can have failed to notice the enormous increase in the literature connected with this branch of industry which has taken place during the past few years. The tables in the libraries of the Patent Office and the Scientific Societies are now loaded with trade or other periodicals, while every year brings considerable additions to the already crowded shelves. The investigator into a given subject, therefore, has now at his command a mass of material from which to obtain information; and the only impediment to its ready utilization is in most cases the absence of some systematic guide to the contents of the storehouse of knowledge which he wishes to enter. This want it has been the endeavour of the proprietors of the "Engineering Magazine" to supply in their "Engineering Index," the third volume of which, embracing the five years ending December, 1900, has just been forwarded to us.* When it is stated that it is a book of over 1000 large octavo pages, and that the text is printed in two columns, in type about the size of that used for the small advertisement pages in the "JOURNAL," some conception may be formed of the mass of matter which has been brought together by the Editor, Mr. H. Harrison Suplee, B.Sc., who is the Mechanical Editor of the "Engineering Magazine," and his Assistant, Mr. J. H. Cuntz. The labour involved in the production of such a book as the one under notice can only be appreciated by anybody who has tried his hand at the dreariest of all dreary literary drudge-work—index-making. It contains about 40,000 entries taken from nearly 200 sources, compared with the 6000 entries from 62 sources of its immediate predecessor. The collection, arrangement, and revision of these entries was a stupendous task; and those who were entrusted with it must be congratulated on having successfully accomplished it. They are conscious that, in a work of such magnitude and character, there may be points which are open to criticism; and possibly these may present themselves when the Index comes to be made use of. But, judging the work in a broad and generous spirit, we think it reflects much credit on all engaged in it. Everybody will agree with the opening words of the Editor's preface, that "next to knowing a thing comes the faculty of knowing where to look for it." We trust that the quest for information in the pages of the "Engineering Index" will always be attended with satisfactory results. This will be the compilers' reward for their earnest and careful labour.

* The "Engineering Index." Office of the "Engineering Magazine," New York and London; 1901.

THE COAL QUESTION IN 1901.

THE various aspects of the question of coal supply occupied a considerable space in the pages of the "JOURNAL" during last year, especially in the earlier months, when buyers and sellers had not come to terms in regard to the usual annual contracts. That time, and the anxious and harassing days from November, 1899, up to the end of 1900, are beginning to present themselves to the memory almost as a bad dream, though the conditions then existing were at the time only too real for the peace and happiness of the gas manager. When the year that has just ended opened, all anxiety as to the maintenance of a sufficient stock of coal, such as gave managers sleepless nights in the previous winter and spring, had disappeared. But the important question of the price at which future supplies would be obtainable was still open. A reduction on current contract rates was certain, for the market price had already fallen considerably; what was still problematical was the possible extent of the reduction.

It is with a certain amount of satisfaction that we recall the fact that events fully justified the advice we ventured to give to coal users at the beginning of 1901, and to repeat constantly during the ensuing weeks—namely, to refrain from entering into fresh contracts until sellers were willing to make very material reductions in price. The risks involved in playing a waiting game were, it was urged, reduced by the existing circumstances to a minimum; and so events proved. The coalowners tried all they knew to keep up prices and induce customers to buy; but to no purpose. The railway companies who went into the market at the beginning of the year for three months' supplies were offered a reduction of 1s. per ton, and obtained one of 2s. 6d. Those who bought their coal at the end of March, forced the collieries to sell at 7s. per ton below 1900 figures—a reduction that was actually greater than the increase of 5s. over 1899 rates obtained by the coalowners when the "boom" was at its height. Gas companies were also able to secure material reductions. In February, Mr. Livesey announced that the Crystal Palace District Gas Company had made a contract of 9s. 6d. per ton f.o.b. Tyne; and early in April, it was made known that the South Metropolitan Company had bought large quantities at about 6d. per ton below that figure. This took the price of gas coal down to the level of 1899 contracts; and at about that price, the bulk of coal required for gas-making purposes during the contract year ensuing was bought. So ended the great "coal boom," which will not soon be forgotten, either by those who profited or by those—the far greater number—who suffered therefrom.

As a direct consequence of that period of abnormal profits in the coal trade, came the imposition of the 1s. duty upon coal exports, other than "bunker" and small coal. The wisdom of the change in our fiscal policy has been canvassed freely, in the columns of the "JOURNAL," as well as elsewhere. As to its effect upon the export trade, it is impossible yet to do much more than conjecture, seeing that the duty only comes fully into force with the beginning of this year, owing to the exemption of a large number of contracts. One certain effect, however, has been the maintenance of a fairly heavy rate of export until the end of the year, in order that the exemption might be secured on as heavy a tonnage as possible. This will result in a reduction in the shipments during the early part of this year.

A further consequence of the dearness of coal has been the revival of the question as to the extent and probable duration of our national coal stocks, and as to the wisdom of allowing unrestricted sales of coal to foreign countries. This revived discussion led to a demand—to which support was given in these columns—for the appointment of a fresh Commission of Inquiry, so many new facts and conditions having presented themselves for consideration since the Argyle Commission completed its five years' labours in 1871. After considerable hesitation and delay, an excellent Commission has been appointed, and will, it may be assumed, proceed upon the path of its inquiries with that dignified dilatoriness that is characteristic of all Royal Commissions. Some years hence, we may hope to be able to discuss the information that is obtained, and opinions that are formed, upon the subject of inquiry.

Two aspects of the coal question that have called for considerable attention during the past year, and are likely to require still more consideration in the future, are those of American competition and of labour. So far as the first is concerned, the past twelve months have witnessed a further development of the exportation of coal from America to Europe. A great deal of the coal so exported during 1901 was, however, bought by the importers before the heavy fall in the price of British coal; and it remains to be seen, and is in fact doubtful, whether the volume of these exports will be maintained. Much depends on whether the American Legislature passes a Subsidy Bill—granting a bounty, as proposed, equivalent to 2s. 6d. per ton on exports. If such a measure be passed, the Americans will be in a position to make a strong bid for the European market. This is, however, rather by way of forecast than retrospect, with which we are at present chiefly concerned.

Nothing more was heard last year of the displacement of British by American coal in the English markets. The cargo of Philadelphian coal bought by the South Metropolitan Gas Company in August, 1900, has not been followed by others. We do not think that anyone who understood the facts of the matter ever thought it would be. When the people of the United States decide to supply us with coal carriage paid, their coalowners may prove formidable competitors to ours; but not, it is safe to say, before.

There were several considerable local strikes of coal mine workers during 1901; but no general or district stoppages. The wage question at times threatened trouble in Scotland; but, while discontent at the reductions made (in all, from 8s. to 6s. per day) has been, and continues to be, expressed, no conflict has broken out. In the North of England, wages have been reduced somewhat, with no more serious consequence as yet than an aggravation of tbe miners' inclination to keep down the output. In the Federation districts, other than South Wales, no reduction has been made in wages, which remain at the maximum of 60 per cent. above standard rates. In South Wales, the wages payable under the sliding-scale have fallen, but only slightly, and remain at a very high level. With a view to averting a further fall in the price of coal, and in wages, the miners there, following the instructions of their leaders, have taken several "holidays" not sanctioned by the coalowners. This has been much resented by the owners, who prefer to manage their business themselves, and legal proceedings are pending. All the indications point to serious trouble in the Welsh coalfields when, or before, the sliding-scale agreement expires—namely, at the end of this year.

Numerous small strikes, or threats of strikes, arose through the objection of the Unionist miners to working with non-Unionists. A general strike was threatened against the imposition of the export duty; but no one seriously believed it would take place, and the threat came to nought. Another proposed occasion for a general strike was the rejection of the Mines Eight Hours Bill; it being suggested that the miners should take by force what they could not obtain from Parliament. In this instance, also, the proposal was only by way of "bluff," of which, when it had ignominiously failed to frighten anyone, no more was heard.

The general tendency of the miners to keep down the output of the pits will undoubtedly make itself evident in the statistics for the year when they are published. The total output of the Kingdom rose from 202 million tons in 1898, to 220 millions in 1899, and 225 millions in 1900. It is doubtful whether the total for last year reached the 225 million mark, in spite of the increase in the number of men employed in the mines.

In concluding a review of the coal question during the eventful year 1900, we said that everything pointed to there being a different history to recount when the time came to look back upon the events of 1901, and so indeed is the case; while, so far as the relations of supply and demand are concerned, 1902 promises to be less interesting than its predecessor. However, just as the country has occasion to be thankful when foreign politics are forgotten, so has the gas industry cause to rejoice when the coal question loses its interest—speaking in the comparative sense, with 1900 in one's mind. It is to be hoped that it will be many a day before that question again becomes as burning as it was two years ago. In the year that has now begun, labour difficulties promise to be the most prominent feature in the coal world, as elsewhere. What their extent and consequences will be, no one can possibly foretell.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 41.)

ALTHOUGH last week was cut in the middle by the closing of the Stock Exchange on New Year's Day, business was fairly animated; and the conclusion of the last settlement in the old year kept the first portion of the week brisk. Upon the reopening on Thursday, a very cheerful feeling was at once apparent, which lasted to the close; so that the new year has made a happy beginning, and we trust the improvement may be prolonged. Prices in almost every department showed some degree of improvement. In the Money Market, there was a very strong demand up to the end of the year; but as soon as that was turned, the usual reaction set in, and supplies were abundant. Discount rates ruled easier. Business in the Gas Market was extremely quiet and restricted, and there were no movements of particular interest. Changes of quotation were few and slight, and were for the most part confined to issues of only secondary importance. But, such as they were, they were all in the upward direction; and the general tone of the market was firm. In Gaslights, the only feature was an advance of a point in the debenture. South Metropolitan and Commercial were little dealt in, and were unchanged. In the Suburban and Provincial group, Brighton had a slight recovery. Nothing marked the Continental Companies. In the remoter world, Buenos Ayres, River Plate, and Sydney were advanced. In the Water Companies, movements were irregular. Chelsea and East London were lower, while Lambeth and Southwark had small rises.

The daily operations were not of a character calling for detailed notice.

We append as usual a comparative table showing the prices of Gas and Water Stocks on the last day of the year, and the corresponding prices of a twelvemonth ago. It forms a somewhat chequered list, and shows that, while some first-class issues have risen, others of equal rank have fallen. This would seem to

indicate that while all perhaps have risen from the low points touched last year, the advance in recovery has been unequal, and not all have yet quite made up their losses. When the reports and accounts for the half year just completed have been published, a quicker rate of recovery may fairly be expected.

GAS COMPANIES.	Prices on Dec. 29, 1900.	Prices on Dec. 31, 1901.	Gain or Loss.
Alliance and Dublin Company, 10 per cent.	19—20	18—19	−1
Do. 7 per cent.	13—14	13—14	—
Australian (Sydney) 5 per cent. Debentures	101—103	100—102	−1
Bombay, Limited	6—6⅛	6⅛—6¼	+⅛
Do. New, £4 paid	4—4⅛	4⅛—4¼	+⅛
Brentford, Consolidated	255—260	265—270	+10
Do. New	183—188	192—197	+9
Do. 5 per cent. Preference	137—142	130—135	−7
Do. 4 per cent. Debenture Stock	115—118	112—115	−3
Brighton and Hove, Original	220—230	213—218	−9½
Do. A Ordinary Stock	150—160	150—155	−2½
British	39—41	41—42	+1½
Bromley, Ordinary 10 per cent.	24—26	24—26	—
Do. 7 per cent.	19—21	19—21	—
Buenos Ayres (New), Limited	8¼—8¾	9¼—9¾	+1
Do. 4 per cent. Debenture	95—98	94—97	−1
Cagliari, Limited	23—25	22—24	−1
Cape Town and District, Limited	13⅛—14½	14⅛—15⅝	+1
Do. 6 per cent. 1st Mort.	53—55	52—54	−1
Commercial, Old Stock	275—280	265—270	−10
Do. New do.	207—212	203—208	−4
Do. 4½ per cent. Debenture Stock	132—137	130—135	−2
Continental Union, Limited	165—170	162—167	−3
Do. 7 per cent. Preference	165—170	160—165	−5
Crystal Palace Ordinary 5 per cent. Stock	117—122	122—127	+5
Do. 5 per cent. Preference	130—135	123—128	−7
European, Limited	18½—19½	19—20	+⅝
Do. £7 10s. paid	13⅝—14½	14—15	+½
Gaslight and Coke, 4 per cent. Ordinary	95—97	97—99	+2
Do. 3½ per cent. maximum	92—94	88—90	−4
Do. 4 per cent Con. Pref.	115—118	111—114	−4
Do. 3 per cent. Con. Deb.	94—96	90—92	−4
Hong Kong and China, Limited	13—14	13—14	—
Imperial Continental	203—208	208—213	+5
Do. 3½ per cent. Deb. Red.	100—102	100—102	—
Liverpool United A	—	232—234	—
Do. B	—	170—173	—
Do. Deb. Stock	—	119—120	—
Malta and Mediterranean, Limited	4⅜—5¼	4⅛—5	−⅛
Metropolitan of Melbourne, 5 p. c. Deb.	105—108	105—107	+½
Do. Do. 4½ p. c. Deb.	104—106	102—104	−2
Monte Video, Limited	9⅛—10⅛	9—10	−⅛
Newcastle and Gateshead, Consolidated	214—216	214—216	—
Do. 3½ p. c. Deb. Stk.	103—104	98—100	−4½
Oriental, Limited	7—7⅛	7⅛—8	+⅛
Do. New, £4 10s. paid	5⅞—6¼	6⅞—7¼	+1
Do. do. 1879, £1 paid	1¼—1⅜	1¼—1⅜	—
Ottoman, Limited	5—5⅛	5⅛—5¼	+⅛
River Plate, Ordinary	10—10½	9¾—10¼	−¼
Do. 4 per cent. Deb. Stock	98—100	94—97	−3½
San Paulo, Limited	11—12	11—12	—
Sheffield, A.	232—236	242—244	+9
Do. B.	232—236	241—243	+8
Do. C.	232—234	241—243	+9
South Metropolitan, 4 per cent., Ordinary	130—135	123—125	−8½
Do. 3 per cent., Deb. Stk.	95—98	92—94	−3½
Southampton, Ordinary	107—112	102—106	−5½
Do. 4 per cent. Debentures	117—122	104—109	−13
Tottenham and Edmonton, A 5 per cent.	112—117	122—127	+10
Do. B 3½ per cent.	85—90	95—100	+10
Tuscan, Limited	7—8	7½—8½	+½
Do. 5 per cent. Deb. Red.	98—102	95—100	−2½
West Ham, 10 per cent.	—	9½—10½	—
Do. 7 per cent.	—	12½—13½	—
Do. 4 per cent. Deb.	—	105—110	—

WATER COMPANIES.	Prices on Dec. 29, 1900.	Prices on Dec 31, 1901.	Gain or Loss.
Chelsea, Ordinary	305—308	310—320	+8½
Do. 5 per cent. Preference	155—160	150—155	−5
Do. 4½ per cent. Preference Stock, 1875	142—145	138—143	−3
Do. 4½ per cent. Debenture Stock	143—148	140—145	−3
East London, Ordinary	193—198	200—205	+7
Do. 4½ per cent. Deb. Stock	147—152	140—145	−7
Do. 3 per cent. Deb. Stock	98—100	95—100	−1½
Grand Junction 10 per cent. maximum	109—112	113—116	+4
Do. 4 per cent. Deb. Stock	130—135	122—126	−9½
Kent	303—308	300—305	−3
Do. New, 7 per cent. maximum	200—210	200—205	−2½
Lambeth, 10 per cent. maximum	293—298	293—298	—
Do. 7½ per cent. maximum	208—213	217—222	+9
Do. 4 per cent. Debenture Stock	127—130	125—130	−1
New River, New Shares	415—420	395—405	−17½
Do. 4 per cent. Debenture Stock	128—133	125—130	−3
Southwark and Vauxhall, Ordinary	192—197	193—198	+1
Do. Do. 7½ per cent. do.	185—190	183—188	−2
Do. Do. 5 per cent. Pref.	155—160	150—155	−5
Do. Do. 4 p. c. A Deb. Stk.	128—133	124—129	−4
West Middlesex	280—290	280—290	—
Do. 4½ per cent. Deb. Stock	140—145	137—142	−3
Do. 3 per cent. Deb. Stock	98—100	96—98	−2

Dr. Rideal on Water Purification.—At the Society of Arts, next Monday, Dr. Samuel Rideal, F.I.C., will commence a course of four Cantor Lectures on "The Purification and Sterilization of Water." The opening lecture will be devoted to the subject of purification by uncontrolled natural agencies. The remaining lectures will be delivered on Jan. 20 and 27 and Feb. 3.

Deposits of Iron Carbonyl on Mantles.—A few months ago, there was published in the "Revue Industrielle" a note in which Herr Dicke demonstrated that, in certain circumstances, water gas, even when employed at the usual pressure, deposits on gas-mantles a brown powder, which rapidly renders them unfit for use. Writing, in reply, on behalf of the International Society of Water Gas (Strache System), M. Duvinage, in a recent issue, stated that he has found, in the manufacture of pure water gas, purification with sulphuric acid has invariably produced a gas free from all trace of iron carbonyl. With regard to the objection that sulphuric acid is unsuitable as a purifier on an industrial scale, and that the process is too powerful to be employed by ordinary workmen without serious inconveniences, M. Duvinage replied that practical experience extending over some years in their works disposed of it. All difficulties had been overcome by having suitably constructed purifiers.

GAS BILLS FOR 1902.

ACCORDING to annual custom, we now proceed to give an abstract of the leading provisions of the various Bills relating, either wholly or in part, to gas supply which have been deposited in the Private Bill Office, beginning with those proposing to add to the number of statutory gas companies.

The Bradford-on-Avon Gas Bill proposes to incorporate with statutory powers the Bradford Gas and Coke Company, formed in 1834. The present capital of the limited Company consists of £10,000, divided into 400 shares of £25 each, of which 280 are fully paid up, and the remainder are paid up to the extent of £8. The Company have not borrowed any money. The district of the incorporated Company is defined. The capital is to be increased to £18,000, whereof the sum of £7960, representing the present capital of the limited Company, is to rank as original capital, bearing 10 per cent. dividend. The balance is to be new 7 per cent. capital. A clause provides for the annual expenditure on revenue account of a sum not exceeding 1 per cent. on the paid-up capital for the time being, for renewals and repairs. The fund thus formed is to be invested as trust money, and may accumulate until it amounts to 10 per cent. on the capital, when the interest is to be carried to the credit of the fund available for dividend. Borrowing powers to the extent of one-third of the whole capital are asked for. The sliding-scale is proposed, with 4s. 2d. as the initial price for 14-candle gas supplied within the urban district, and 6d. per 1000 cubic feet extra in the outlying parts. The adjustment is to be made half-yearly. Discounts up to 20 per cent. may be allowed to consumers in consideration of prompt payment or large consumption. The usual clause for the specification and inspection of consumers' fittings is inserted; and permission is desired for making application for an electric lighting Order.

The Chard Gas Bill is to incorporate the Chard Gas and Coke Company, originally formed in 1870. The share capital of the limited Company consists of £12,000, divided into 2400 shares of £5 each, whereof 1200 have been issued as ordinary shares, and 1200 as preference shares, entitled to a preferential dividend of 5 per cent. per annum. There is a mortgage debt of £3000; and the Company have spent from time to time £1500 out of revenue on the improvement of the works. It is proposed to increase the capital of the Company to £30,000, whereof £6000, representing the original share capital of the limited Company, is to be called "original capital stock A;" £1500, representing the amount expended out of revenue upon works extensions and improvements, is to be called "capital stock B;" and £6000, representing the preference share capital of the limited Company, is to be called "original preference stock." The rates of dividend payable on these various classes of original fully-paid stock are 10, 5, and 5 per cent. respectively. The new capital of £16,500 in ordinary stock is to bear a 7 cent. dividend. Stock unsold is to be offered to existing proprietors or consumers. Borrowing powers are to be in the proportion of one-third of the total issue. The sliding-scale is proposed, with 4s. 2d. per 1000 cubic feet as the standard price for 14-candle gas sold within the borough and 4s. 7d. outside. Interest at the rate of 3 per cent. is to be payable on consumers' deposits. A fittings-inspection clause is proposed, but not in the same terms as the corresponding one in the preceding Bill. Consumers are to be responsible for debts incurred by sub-tenants.

The Caterham and District Gas Bill is to incorporate a Company formed originally in 1869 under the name of the Caterham and Kenley Gas Company, Limited, subsequently altered to the Caterham and District Gaslight and Coke Company, Limited, who as such obtained a Provisional Order in 1887. The share capital of the limited Company consists of £35,000, whereof £25,000 is original capital, and £10,000 is additional 7 per cent. capital—one-half existing as preference shares. The Company have also issued mortgage debenture stock to the amount of £6250, and owe besides £2300 or thereabouts. The district of the Company is settled. The wording of the clause defining the "general purposes" of the undertaking is novel. It states that the Company "shall be established for manufacturing and supplying gas for light, heat, incandescent lighting, power, and any purpose to which gas, whether manufactured from coal, slack, or other substance or liquid, may be applicable within the limits of this Act," and may provide and deal in residuals and so forth. The capital is to be increased to £60,000, whereof £40,000 is to be issued as ordinary shares and £20,000 as preference shares. The additional capital of £30,000 to be created by the Act is to be issued half-and-half as ordinary and preference capital. Unsold capital may be offered to shareholders, employees, or consumers. The loan capital is limited to one-fourth of the paid-up capital. The Secretary's salary is to be determinable by the Directors. Pipes may be utilized for ancillary purposes. The maximum price of gas supplied "for illuminating purposes" is 5s. per 1000 cubic feet. All "coal gas" supplied by the Company is to be subject to the usual requirements as to pressure, and to be of 14 candles illuminating power. "But power gas need not be of any illuminating quality;" and is to be exempted from the Act of 1871. Consumers' fittings may be prescribed and inspected. Among gas fittings the Company are empowered to supply (but not manufacture), incandescent burners are specified.

The Rickmansworth Gas Bill is to incorporate and confer

statutory powers upon the Rickmansworth Gaslight and Coke Company, originally formed in 1852. A Provisional Order was obtained in 1885. The existing capital so authorized consists of £10,733 original capital bearing a 10 per cent. dividend, and £5000 additional capital entitled to a 7 per cent. dividend. There is a mortgage debt of £3933. The Company have expended out of their revenue the sum of £2250 on capital purposes, which they desire to repay out of any premiums obtained on additional capital issues. Like the preceding Bill, this one contemplates the addition to the undertaking of a business in "power gas," which is defined to mean "any gas capable of being used for purposes of motive power and heating, but not being of the quality prescribed under this Act, and the Acts incorporated with this Act, for gas supplied for lighting purposes." Another fresh definition is that of "proportional meter," which means "a gas-meter which measures and records a constant fraction of the total quantity of gas passing through the meter." The "general purposes" clause of the Bill provides for the manufacture and sale of this "power gas." The capital is to be increased to £100,000, with one-third borrowing powers. The sum of £2250 is to be dealt with, out of the premiums received, as divisible profits. The capital is to bear a uniform dividend of 5 per cent. The Directors are to appoint and determine the remuneration of all the officers, including the Secretary. Pipes may be used for ancillary purposes. The sliding-scale is proposed, with 4s. 7d. per 1000 cubic feet as the initial price for 14-candle lighting gas. Consumers' fittings may be specified and inspected.

The Shepton Mallet Gas Bill is to incorporate a Company dating from 1836. The capital of the Company consists of £4250, with a loan of £1450. In addition, the Company have expended out of revenue £4500 upon the works. It is proposed to increase the capital to the sum of £18,500, whereof £4250 is to be called the original capital, an equal sum to be called the "1902 capital," being the money expended out of revenue for capital purposes; and £10,000 additional capital. The rates of dividend proposed are 10 per cent. on the original capital, 5 per cent. on the improvement capital, and 7 per cent. on the new ordinary, or 5 per cent. on the new preference shares. Unsold issues may be offered to proprietors, employees, or consumers. Borrowing powers are to be in the proportion of one-third of the whole issue. Consumers' gas-fittings may be specified and inspected.

The Wadhurst Gas Bill is to incorporate a Company to supply with gas the parishes of Wadhurst, Ticehurst, and other places in Sussex. The Company propose to manufacture and supply "all kinds of gas for lighting, heating, motive power, and other purposes," with a share capital of £25,000 and £8000 loan. The Company will purchase the undertaking of the Ticehurst Gaslight and Coke Company, Limited. The maximum price of 14-candle gas is to be 5s. 6d. per 1000 cubic feet. The Company offer to pay 5 per cent. interest on consumers' deposits. Permission is sought to apply for an Electric Lighting Order.

ELECTRIC LIGHTING MEMORANDA.

Methods of Charging for Electricity—Mr. A. Wright's Suggestions—The Sad Example of Ayr—Electric Traction Dangers.

METHODS of charging for electricity supplies for lighting purposes continue to exercise the minds of central station managers. Strictly speaking, there is no electrical engineering or electrical science about this question, which is of a purely commercial character. The fact that engineers and electricians are so troubled with it illustrates once more the essence of the difference between school science and laboratory concepts, and the management of works. The man who has charge of the works is expected to make them pay; and, engineer though he may and ought to be, he must be a business man first. The determination of the fair charge for a domestic supply of electricity for lighting is a very difficult and thankless task. Mr. Arthur Wright, who invented the Brighton system of charging, has been at the subject again, in a very long paper which may be taken generally as a confession that the writer is not quite happy about it. He finds that the practice followed in many localities, of charging for electricity like gas, on the quantity registered by the meter, with a reduction to large consumers, is radically wrong. A uniform charge without discount keeps the cost and charges to the majority of possible consumers unnecessarily high, while it keeps the business and load-factor of the undertaking unnecessarily low. Where discounts on the biggest consumers' bills are included in such a system, it creates greater inequality by allowing the large tradespeople and millowners to get their electricity at an unfairly low rate.

The difficulty is to convince people as to the superior equity of a differential system of pricing the common service. The principle formulated by the late Dr. Hopkinson is really the fairest for a service which has no reserve, and must be ready to supply the maximum demand, if but for a short time, every day. Obviously, the principle is not confined to electricity supply. If every enrolled member of a police force is to be paraded in the streets for duty between sunset and a fixed hour every night, the service will cost more than it would if a reasonable system of relief were possible. Unfortunately, in the case of electricity, the theoretical beauty of the principle is obscured by many practical considerations. The supply itself is so dear that the user is apt to grumble at his bills howsoever they may be made out; and where there is an admitted discrimination, he is sure to object if the difference hurts himself. The man who is charged the top rate thinks this is because another man may be getting the light cheaper; and he does not see why. Of course, this is not the object; but it appears so. For this reason, local authorities are unconquerably averse to settling the initial charge, under the Hopkinson system, at the full maximum of 8d. per unit permitted by existing Orders. Mr. Wright, with Spartan rigour, would have this done. He declares that he cannot see any sufficient reason for charging a lower figure, or for not maintaining it for the requisite number of hours per annum. Can he not? The local authorities can. They dare not let it go forth that their price for electricity is the highest permitted by law. It may be true, as Mr. Wright says, that it is cheaper to consumers all round to keep the initial price up and make a good drop after the cost of finding the necessary service has been paid; but it is against human nature to exhibit such fine faith in figures.

Local authorities are afraid to charge enough for electric light as it is. They have been lauded ere now for charging less as a rule than supply companies; and we have been abused for remarking that the companies know their own business best. It is therefore amusing to observe the wriggling comment that goes on in the "organs" of Municipalization before everything, when stubborn facts convict local authorities of making a mess of their trading concerns. The case of the municipal electric lighting of Ayr is in point. Here is an undertaking which stands the unhappy ratepayers of Ayr in close upon £60,000—about the same as Bath—and, do what they can, the managers cannot rake in a gross revenue of more than 10 per cent. upon this amount. No such business can pay; and accordingly here the town has to pay £1127 to balance the accounts of the undertaking for the past year. The prices have been cut too low; but they are probably as high as could be expected from the users. The works cannot go on for long at this rate. On the other hand, it is equally disastrous to pitch the charges too high. Poplar appears to have done this, and has had to make a fresh tariff.

It is beginning to dawn upon the general public that electric railways have certain drawbacks peculiar to themselves which considerably detract from the charm of the system. It is a matter of history gleefully recorded by the electrical journals and the newspapers, that wherever electric "tube" railways, or surface tramways, are opened for traffic, the people flock to them in vast crowds. The positive increase of traffic attributable to the provision of electric working, instead of the more familiar steam or horse traction, is treated as an asset. There was a time when the working of underground railways by electricity was understood to promise a material reduction of the running expenses. Thirty to forty per cent. of the gross receipts were assumed to be sufficient to work the Waterloo and Baker Street line, and even the Metropolitan District Railway. The lines in actual operation, however, do not bear out these sanguine estimates. Still, it has appeared tolerably certain that electric traction would in all cases induce additional business, which in itself would be a reason for adopting it. But some stubborn old railway men have never ceased advising everybody who would listen to them to "wait a bit." They have urged that electric traction should be given a fair trial, and that its ability to completely satisfy the public should not be too readily assumed. Recent events offer at least one aspect which might be regarded as justifying this attitude of reserve. A fatality and a block on the Central London line, and a terrible fire on the Liverpool Overhead Railway—at a point where it happens to run underground—are not calculated to reassure the public as regards the safety of the system employed.

Companies Wound Up Last Year.—The following joint-stock undertakings were wound up voluntarily last year: Acetylene Purifying Company; Aldeburgh Water-Works Company; Brooke, Simpson, and Spiller; and the Coolgardie Water-Works Company. The Gandy Belt Manufacturing Company and the Phôs Acetylene Gas Syndicate were wound up voluntarily, with a view to a continued existence in another form.

Garcke's "Manual of Electrical Undertakings" for 1901-2.—The sixth volume of this useful "Manual," which has just been issued (some weeks later than its immediate predecessor), contains a mass of statistical and other information in regard to electrical undertakings of all kinds. The progress of the electrical industry is shown by the fact that the undertakings engaged in it now number 1500, the aggregate capital involved being £155,000,000, or something like £32,000,000 more than it was a year ago. In the supply of electricity by companies, a sum of £18,553,390 is engaged; by municipalities, £19,165,495. The general statistics include, as before, a schedule containing a close analysis of the revenue accounts of the undertakings, supplemented with a coloured diagram showing comparative results of working. In the text of the book, the latest accounts are followed by a table giving the main comparative figures for the last few years; thus affording a means of gauging the recent progress of each undertaking. The "power" schemes of the past year are described at length, and illustrated by a map of the district included. Particulars are also given of the various Electrical Orders and Bills promoted last session. Another new feature is the list of highest and lowest prices of electrical securities for the last three years. The text of the "Manual" has been brought as far as possible up to date.

THE DISCOVERY OF COAL GAS.

A Tribute to the Memory of Minckelers.

THE honour of being the discoverer, or inventor, of coal gas, as an illuminating agent, has been variously claimed—by some, for Murdoch; by others, for Lebon; and latterly, by yet others, for Minckelers. Probably at some later time, a yet earlier worthy will have the honour thrust upon him; for there can be little doubt that from the earliest times when coal came into common use as a fuel, men of an experimental turn of mind—who are to be found in every age and every land, and are worthy to be considered the salt of the earth—remarked that coal yielded an inflammable air which would serve in place of candle or oil-lamp as a source of light. But in times when facilities for the communication of observations or ideas to fellow men were not so great as now, their remarks did not extend beyond each one's narrow circle; and they failed to achieve fame. Perhaps some musty tome or discoloured manuscript lying unexamined, and even uncatalogued, in the cellars of the Bodleian Library, may contain the record of some observer's investigation of coal gas antedating the observations of those who have hitherto been reputed to be discoverers of that gas. But as the cataloguing of books in that Library proceeds at the rate of about 30,000 a year, while the number of accessions is over 60,000 *items*, equivalent to some 15,000 octavo volumes, per annum, it is evident that it will take many years to overtake the vast arrears of cataloguing. And as uncatalogued works are unlikely to reach a reader's hands, any secrets contained in them, such as the story of a prior discovery of coal gas, stand but little chance of being revealed at present.

Until, therefore, a begrimed manuscript, or faded volume, unearthed by a diligent student, from among the mass of Eighteenth Century literature reposing in the back shelves of the Bodleian and other large libraries, is found to reveal an earlier discoverer of the practical virtues of coal gas than do some manuscript notes which were on view at the Gas Pavilion at the Paris Exhibition of 1900, we must admit that Jan Pieter Minckelers has a substantial claim to be regarded as the inventor of illuminating gas. These notes were the manuscript of a "Memoir" on "Inflammable Air Extracted from Different Substances," which was printed at Louvain in 1784. They show that their writer was familiar with coal gas. He was a Professor at Louvain. There has been a movement on foot recently to place a memorial tablet on the front of the house at Maastricht, in which he was born on Dec. 2, 1748. But, strangely enough, the first substantial memorial erected to commemorate his early discovery of illuminating gas is to be found far from the scene of his labours. While still uncommemorated in the low countries, where he was born and lived, he has obtained lasting recognition under the sunny skies of Italy. There the sculptor's art has been requisitioned to adorn in a fitting manner the fine new offices of the "Società Italiana per il Gaz" (the Italian Gas Company) at Turin.

This Company, formed by successive amalgamations of smaller concerns, now owns the gas-works at Turin, Palermo, Bergamo, Pavia, Tortona, Girgenti, Ferrara, Monza, Casale, Chieti, Novara, Carrara, Savona, Crema, Cremona, and other places in Italy. Its new chief offices in Turin are situated in the angle formed by two streets, and constitute a very fine block. The General Manager of the Company, Signor Leone Mariani, after studying the documents in the Gas Pavilion at the Paris Exhibition, decided that a bust of Minckelers should be placed above the main entrance to these offices. The Architect entered fully into the spirit of Signor Mariani's idea; and the result was the fine bust shown in the annexed illustration, which is reproduced from the pages of "Het Gas." On one face of the building, above the

upper windows, are busts of Lebon, Murdoch, Clegg, Winsor, and Welsbach; on the other face, are busts of Lavoisier, Dumas, Regnault, Bunsen, Schilling, and Berthelot. The place of honour, however, in the centre between the two faces of the building, is conceded to Minckelers. The conception is a pretty one; and it appears to have been well carried out in a thoroughly artistic manner, as was to be expected of an artistic people.

It is but just to add that the claims of Minckelers have been constantly brought to the front by Heer P. Bolsius, the Manager of the gas-works at s'Hertogenbosch (Bois le Duc), who is one of the Editors of our excellent monthly Dutch contemporary "Het Gas." He was mainly responsible for the exhibition of Minckeler's notes at Paris, and later at Vienna; and thus, indirectly, he inspired Signor Mariani to place Minckeler's bust in the foremost place on the new offices of the Italian Company.

DATA FOR ESTIMATING THE COST OF POWER.

AT the Cornell University, United States, it appears to be the rule that candidates for the degree of Master of Mechanical Engineering should submit theses on selected subjects. Mr. Clyde D. Gray, of Sibley College, accordingly presented last year as his thesis a collection of data relating to the cost of mechanical power, as produced and utilized by different methods. This voluminous compilation has been published in full in the "Journal of the Franklin Institute;" and it is now proposed to give an abstract of the compiler's most useful data. It must be premised that it did not enter into Mr. Gray's scheme of labour to ascertain or verify any information at first hand. All that he proposed to do was to consult the "literature" of the subject, and bring together "the results of such tests and estimates as seemed reliable." How this judgment was to be proved is not stated; but apparently it only means that quotations were to be made mainly from reputable authorities. This, it may be remarked parenthetically, betrays the influence of the scholastic spirit upon such a matter-of-fact question as the present subject. It has ever been the weakness of schools to defer to authority, and to erect mere acquaintance with the dicta of some master to the dignity of knowledge of the thing spoken of, which, of course, it is not.

However, mere book learning in the preparatory studies of engineering science is worth something so far as it goes; although we would doubt its validity in constituting its possessor a Master of Mechanical Engineering, or anything else. In the case in point, the compiler does not think it worth while to preface his investigation by making it clear what is the horse power he proposes to treat of—a very important point, when it is borne in mind how much confusion has resulted from vagueness in this respect, in connection with the working of centrifugal pumps, air-fans, gas-engines, and motor-cars. Instead, he commits the imprudence of assuming a perfect knowledge on his readers' part, of the meaning of the term, and plunges forthwith into a statement of the amount of power exerted by a man, which he very thoughtfully characterizes as variable and depending upon the individual to a large extent. It does, indeed! It does not occur to Mr. Gray that where there is the element of will to be reckoned with, as in the case of the work of men and animals, the living motor is possessed of the most perfect kind of variable gear conceivable, which differentiates it radically from every mechanical agency. The machine cannot "make an effort," whereas the animal can do this at will, instantaneously, almost without being conscious of any mental process of adjustment. When we can design and construct a machine that will adjust the power expended in making a movement to the exact requirements of the resistance to be overcome—as a man does in the act of lifting a big or a light shovelful of coals—then the so-called "power" of animals and machines will be comparable on even terms.

Mr. Gray cites Rankine and Box as authorities for the determination of the power of a horse, and concludes that the mechanical unit of a horse-power—the lifting of 33,000 lbs. in one minute—is "too large when compared with the actual work of the average horse." So the first designers of "horseless carriages" imagined, until they tried it, and discovered that the average cab-horse is

more than a match for a nominal 5-horse power motor machine. The designers of many "labour-saving" machines have also made similar discoveries, to their cost. It is unnecessary to follow Mr. Gray in his investigation of the cost of wind power, which is more curious than practical. As regards the cost of water power, this is altogether a local question, not worth considering in the majority of places where work is carried on, and where there is either no water or no fall. In most settled regions of the earth's surface, the water courses are slow, and the expense of obtaining power from them is prohibitive. In mountainous parts, water wheels of the impulse class are found useful; but it is waste of time to generalize from the recorded examples. Still, for the interest of the subject, it is worth stating that the water power at Niagara Falls is sold for $13 = 54s. 2d. per horse power per annum. Water power is confessedly a precarious investment for both providers and users.

Coming to the steam-engine, Mr. Gray remarks that it is the best known and most extensively used source of power, and is not likely to be very noticeably improved upon. He discusses boiler fuels, boilers, and engines, upon the results of numerous tests. This is really the most instructive portion of the paper. The results of the examination of the boiler tests is to show that there is not a vast deal to choose between the efficiencies of the various steam-raising appliances at the command of the power user. The water-tube boiler is the fashion for the time being, because it is safer at the high pressures now employed than the older type of boiler, occupies less floor-space for the power generated, and can be forced. Formerly this type of boiler was much more costly to buy than the fire-tube boiler; but latterly this difference has been much reduced. So far as actual boiler efficiency goes, there has been no advance upon the evaporative results ascertained by the Philadelphian tests of 1876. Mr. Gray mentions oil fuel, only to state that its use is restricted to the sources of supply; and that even here "it cannot compare in economy with coal at the average prices." This branch of the subject, however, is rather slurred over.

Mr. Gray's tables of performances of various types, patterns, and descriptions of steam-engines are very voluminous. As regards costs, he finds that steam power plant, inclusive of boilers and all accessories, but exclusive of buildings, costs from £10 to £12 10s. per horse power installed. To operate it costs from ½d. to 1d. per horse-power-hour; although, of course, the figure is susceptible of local influences. With respect to the gas-engine, it is admitted that this prime mover is coming into use at the present time as a rival of the steam-engine, especially since its speed-regulation has been improved. In the natural gas regions of the United States, where the product of the wells has a calorific value of 1000 B.T.U. per cubic foot, gas-engines should be at their best; but, as a matter of fact, they seem to be more appreciated for use with the manufactured gases of Europe. This is because the need for economizing fuel has scarcely yet begun to be felt in America.

Mr. Gray is nowise critical as to the harmony of his data. He takes into the same category coal gases of 550 and 950 units per cubic foot, and strikes their average without a qualm. Similarly with the producer gases—whether these are of 108 or 160 units matters not to this statistician—he averages them all at 143 units, which is perhaps not far wrong; but the computation is distinctly indiscriminating. And as regards gas-engine performance, it is remarked that a consumption of about 17 to 18 cubic feet of common coal gas per brake-horse-power may be expected of the average modern gas-engine of moderate size. For producer gas, the consumption is usually stated in terms of the coal gasified, which now averages about 1 lb. per indicated horse power. With blast-furnace gas, the consumption per indicated horse-power is about 115 cubic feet.

This is as far as Mr. Gray carries his reliable data. He goes on to deal with other matters, such as lighting efficiencies; but here the authorities dwindle down to few. He quotes from Mr. J. Henderson the following table of the "commercial" efficiencies of various kinds of light chiefly in use—meaning the duty yielded by the coal consumed in every case:

Flat-flame burner	0·23
Argand	0·43
Incandescent electric lamp	0·50
Arc	1·30
Welsbach light	2·30

Unprofitable servants are they all, on this showing. It is the light source itself, however, which is the greatest waster. Comparing the amount of energy radiation which appears as sensible light, with the total radiation, we get the following statement:—

Ordinary wax candle	1·5
Flat-flame gas-burner	1·3
Oil-lamp	2·0
Argand gas-burner	2·4
Incandescent electric lamp	5·0
Lime light	9 to 14·0
Welsbach gas-burner	13·0
Arc lamp	13·0

Yet there are people who persist in burning candles, while the highly efficient limelight is not esteemed as a practical illuminant. The compiler is forced to the conclusion that the electric light is not the cheapest kind of artificial light generally available, incandescent gas-lighting being actually cheaper. This is not an unsatisfactory result of an exercise in mere compilation of technical records, with little or no attempt to obtain critical value for the findings arrived at.

PERSONAL.

Mr. J. Angus, of Strathmiglo, Fife, has been appointed Manager of the Newburgh (Fife), Gas Company.

Mr. W. Hill, who has been managing the Stalybridge Gas-Works since the death of Mr. William Carr, has been appointed Engineer and Manager by the Gas Committee of the Corporation.

Mr. W. Tulloch, Manager of the Eyemouth Gas Company, has been appointed Manager of the Coldstream Gas Company, in succession to Mr. S. G. M'Lusky, resigned. There were 23 applicants for the situation.

Mr. John Paton, who has been employed for many years in various capacities at the Hull station of the British Gaslight Company, has been appointed Working Manager at the Sandwich Corporation Gas-Works.

Mr. W. Nisbet, of Monaghan, has been appointed Manager of the Ballymena Gas-Works, in place of Mr. S. J. Acland, who, as already announced, has become Manager and Secretary of the Brynmawr and Blaina Gas Company.

Last Tuesday night, Mr. William Duff, who, after 35 years' service, has relinquished the management of the Morecambe Gas-Works, entertained the whole of the employees to supper at the Criterion Hotel in that town. In proposing "Success to the Morecambe Gas-Works," he expressed his sincere sorrow at severing his connection with the staff, some of whom he said he had known a very long time; but circumstances had arisen which made it inevitable. He had not the slightest hesitation in saying that the Council possessed splendid gas-works, which would prove very profitable if properly managed. He hoped all present would try to make the undertaking a paying concern. Mr. Duff's health, proposed by Mr. Hodgson, the foreman, was drunk with musical honours; and cheers were given for Mrs. Duff. Mr. Hodgson then handed to Mr. Duff a solid walnut aneroid barometer, bearing the following inscription: "Presented to Wm. Duff, Esq., by the employees of the Morecambe Gas-Works, on his retirement from the position of Manager, 31st December, 1901." Another presentation consisted of a meerschaum pipe in a case, a tobacco-jar, and a cigar-holder. Mr. Duff, in acknowledging the gifts, said they would serve as a happy reminder of the pleasant times spent amongst the donors at the gas-works. They were also tokens of the friendship that existed. It was his intention to stay in Morecambe, and do what he could for its benefit. He would endeavour to obtain a seat on the Council, and, if possible, become Chairman of the Gas Committee.

NOTES.

An Electrolysis Survey.

Professor F. C. Caldwell, of the Ohio State University, has carried out an electrolysis survey in the city of Columbus, Ohio, which is distinguished among American towns as being equipped with the "double trolley," or equivalent means of neutralizing the usual mischief of the return current by tram-rails. The City authorities wished to know how the requirement works. Professor Caldwell's report has been published in the "Engineering Record." In the course of the investigation, many readings were taken of the differencies of potential between the rails and the gas and water mains. Generally, it appeared that these differencies were small except near the power station, from which it follows that the risk of electrolysis was slight. It was recommended that thoroughly good rail bonding, and cross-rail bonding, should be insisted upon in the case of all electric railways. The system of insulated returns should be so maintained that the drop of potential along the rails should be kept as low as practicable. Professor Caldwell believes in keeping the electricity out of the mains as far as is possible. He recommends that new mains should be laid in alley-ways kept as far away from the rails as possible. In laying the pipes, the sockets should point in the same direction as the flow of current, if any is present. Then, if any slight electrolysis should occur, it will generally be at the ends of the sockets, where it will give the least trouble. All pipes should be well asphalted outside, and more especially at the joints after these have been made.

Recovery of Cyanogen from Crude Coal Gas.

The "Revue Générale des Sciences" speaks very well of the Bueb cyanogen-recovery process, as applied to the Dessau Gas-Works, which has been fully illustrated and described in the "Journal." Reference to these cyanide processes is suggested by the gradual resumption of mining activity in South Africa, which will bring a greater demand than ever for this product. The French writer is of opinion that actually gas companies are making large profits from the spent contents of their purifiers—an impression which is for the time being unfortunately erroneous. It is remarked that cyanide recovery from spent oxide is an unsatisfactory proceeding. Bueb's process, on the contrary, has no defects, inasmuch as it removes the whole of the cyanogen from the crude gas before it enters the purifiers. This is effected by passing the gas after leaving the Pelouze and Audouin condenser

through a special washer of the "Standard" type, through which a solution of sulphate of iron flows in a contrary direction to that of the current of gas. The washing liquor is black to start with, but gradually clarifies, and is of a greenish-yellow colour in the last compartment of the washer. The product leaves the washer in the form of liquid mud, which contains 20 per cent. of the yellow prussiate and 6 to 8 per cent. of ammonia. Boiling drives off the ammonia, after which the mud is pressed into a cake containing 30 per cent. of blue, and 44 per cent. of yellow prussiate, and is sold as such. In the process, 200 parts by weight of sulphate of iron yield 100 parts of prussian blue.

The Unintelligibility of Electrical Units.

The unintelligibility of the units of electrical measurement is a constant source of annoyance in the conduct of the industries in which they are used. It is beginning to be discovered that the essence of any system of measurement which is to convey any meaning to the minds of the users, is that the units should be realizable entities. The lack of this common-sense basis is the fundamental weakness of the metric system, which was devised by philosophers far too much above thinking of the common needs of life and trade. Foolish as the fault may appear, it is still the truth that ordinary people have great difficulty in understanding decimal fractions; and where these are compulsory, mistakes are abundant and mental arithmetic does not exist. Complaints are becoming frequent with purchasers and users of electricity, which are referable to the fact that persons of even considerable education are unable to grasp the significance of the language of electric measurement. Users of electric light rarely understand their bills; and the employment of electric motors in workshops is believed to be hindered because the manufacturers insist upon rating them in what is to many a sealed terminology. Prudence dictates that an electric motor should have a measuring device attached to it, to show at a glance what amount of work is actually being done. The instrument which does this is called an ammeter, or there are "wattmeters" which read off the "wattage" directly. This, however, is dark to some people; and accordingly it is reported that there are energy-meters now upon the market which read to horse-power direct. It is hoped that these conveniences will make electric motors more popular.

Comparison of Cylinder Oils.

Mr. J. S. V. Bickford has written to the "Engineer" to describe some experiments of his own on cylinder lubrication. The necessity for these experiments occurred in connection with the working out of the details of steam motor-cars, when the question arose of what oil to employ for the lubrication of cylinders. After writing to many makers, Mr. Bickford decided that the only course open was to make a series of tests himself. He does not pretend to have found out which is the best lubricating oil, but only to have ascertained that certain oils resist heat under particular conditions better than others. The only really satisfactory method of testing a cylinder oil is to set aside two identical engines, running side by side under the same load, and use with them the different oils to be tested, while noting the behaviour of the engines. This is a tedious and expensive kind of experiment. Failing this, Mr. Bickford decided upon a purely comparative test, and determined to expose samples for prolonged periods to temperatures between 800° to 1000° Fahr. in tin-plate dishes, noting the loss of weight and the appearance of the residue. The plan was to pour a measured quantity of the oil into a 3-inch diameter tin dish, which was placed upon an iron plate, over a bunsen gas-burner, maintained at the temperature of melting zinc. The dish and oil were weighed at the end of 30 minutes; and again after three hours. Then another similar sample was treated to the same heat for 21 hours. Of the dark natural oils tested in this way, the Henry Wells' Oil Company's dark superheated cylinder oil showed the best heat-resisting properties; while of the filtered oils, Price's Sherwood valve oil came out best. All the oils tested retained distinct lubricating properties at the end of three hours' treatment; but very few of them were worth anything after 12 hours. Only the dark oil already specified was still fluid and unskinned over at the end of 18 hours. Mr. Bickford also describes an experiment which seems to indicate that when oil is dropped into a steam-pipe, it may be afterwards carried to one end only of the steam-cylinder. He speaks well of Dixon's flake graphite for lubricating a cylinder by means of a common sight lubricator.

The death occurred, on the 27th ult., suddenly, at his residence, of Mr. WILLIAM COOKSON, Manager of the Southend Gas-Works, at Liverpool. He had been in the service of the Gas Company for 40 years. The funeral, on Tuesday, was very largely attended; deceased having been held in high esteem by directors, officials, and workmen.

The "Financial News" says that during last year 3058 new joint-stock companies were registered with an aggregate capital of £139,869,039, compared with 4510 companies and £201,799,429 of capital in 1900. In each year, July was a busy month in company formation; the numbers being 368 in 1900 and 343 in 1901. But the closing month of the former year was a "record" in this particular class of operations, owing, of course, to the passing of the Companies Act; the number of companies being 1155, and the capital involved £46,695,850. The figures for last month were 216 and £24,900,058.

TECHNICAL RECORD.

THE GAS QUESTION IN PARIS.

Scheme for New Works.

Those of our readers who have followed the above question through its various phases, will doubtless recollect that, after the negotiations between the Paris Gas Company and the Municipality were broken off early last year, two Commissions—one composed of members of the Municipal Council, and the other mainly of technicians—were nominated to study this most difficult subject. Their names have been already given in the "JOURNAL," but it may be again mentioned that one of the members of the Technical Commission was M. Lauriol, Engineer-in-Chief of the lighting services of the city. This gentleman has thoroughly investigated the various matters relating to the immediate lowering of the price of gas and to the system on which the supply is to be kept up from 1906, after the expiration of the Company's concession. The result of his labours has been embodied in a voluminous report, which is under the consideration of the Commission, and it has also been laid before the Municipal Council by the Prefect of the Seine. An abstract of the document has appeared in the "Génie Civil," from which the following particulars have been translated.

M. Lauriol in his interesting report studies the entire gas system of Paris, dealing with the best solution of the problem for the consumers and the city. He deals with the following questions: Must gas be manufactured in 1906? If so, what kind and in what quantity? These are the first inquiries made by the author. After having investigated the question whether electricity, acetylene, alcohol, petroleum, carburetted air, poor gas carburetted or not, could practically be substituted for coal gas, and remarked that these various systems are either too expensive or dangerous or unsuitable for extensive plant, he concludes that one must be prepared, in 1906, to distribute coal gas; arrangements being made so that it can be mixed with at least one-third of poor gas. He estimates that the works should be able to supply 2 million cubic metres (70,634,000 cubic feet) per diem, and that their dimensions should make it possible to double this output if requisite. It is to be remarked that the manufacturing power of the existing works of the Company is about 1½ million cubic metres (about 53,000,000 cubic feet). It would then be sufficient to annex to these works water-gas plant with a capacity of 500,000 cubic metres (17,658,000 cubic feet) per diem to attain the figures estimated by the reporter.

In order to appreciate the circumstances and cost of new works if the city were compelled to build them, and also to have an element for ascertaining the industrial value of the existing works in the event of their having to be purchased, M. Lauriol studies the question of the construction of new works as follows.

Plan of New Works.—The projected works having to supply 1½ million cubic metres of coal gas daily, will need 5000 tons of coal—viz., 15 trains of 400 tons, or 20 boats of 300 tons. It would hardly be wise to concentrate this traffic in a single works, as any kind of accident, damage to the railroads, cessation of work on canals, &c., might paralyze the whole of the operations, to say nothing of the perturbation caused to the general traffic by carrying the coal to a single point in carts, and the initial difficulty there would be in providing lodgings for the thousands of workmen employed by this single centre of production. An example of such a considerable establishment is furnished by the Beckton Gas-Works, which supply half the London population. However, the favourable situation of these works on the banks of the Thames, near the sea, greatly facilitates coal supplies, which are carried by sea-going vessels, and not canal boats. Consequently, M. Lauriol advocates the construction of three works in the Paris suburbs—at Vitry, Bondy, and Gennevilliers. Selection of sites is decided by circumstances favouring the acquisition of vast tracts of building land near water and railways. The daily production of each would be a maximum of 500,000 cubic metres of coal gas, involving a supply of 1700 tons of coal per diem.

Coal Depôts.—If it is desired to lay in a month's supply of coal, the depôts must contain about 50,000 tons at each works. Storing the coal to a height of 4 metres (13 feet) would then require a surface of at least 14,000 square metres; and if we provide for some empty compartments and others filled, the area of the coal depôts would be 25,000 square metres. According to the reporter's plan, these depôts would be roofed over, and transversally divided into four parts and longitudinally into five. Waggons would run over the separating partitions, so as to empty coal into the compartments. The bottom of the latter would be slanting, in order to allow the installation of longitudinal conveyors, which, after being loaded with coal, would carry it to a transversal conveyor serving a breaking-engine and hoists, two in number per section of furnaces,

Furnaces.—The furnaces of these new works would be, of course, regenerative. The employment of generators serving several groups would give real advantages as regards cost of heating. As to inclined retorts, M. Lauriol estimates that, notwithstanding the favour they now enjoy, and the number of new works in which they are employed, it is not wise to adopt them for large plant. Horizontal retorts are preferable. They make it possible to change any minute, without inconvenience, the

quality of the coal, which in such works as those of Paris must frequently vary. The inclined retort is also more expensive to construct than the horizontal—about 4000 frs. instead of 2500 frs. per retort, including furnaces and buildings, &c. On the other hand, thanks to the employment of loading and unloading machines, a saving of manual labour can be obtained with horizontal retorts comparable with that given by the inclined settings. The reporter then advocates retorts 3 metres (10 feet) long set back to back. In fact, it is possible that it will be profitable in future to have through retorts. Two retorts set back to back can be replaced by a through one, 6 metres long (20 feet). For the manufacture of 1,500,000 cubic metres of gas daily, at the rate of 260 cubic metres per retort, the number of retorts required, adding 10 per cent. to provide against accidents, would be 6360. M. Lauriol groups them, at each of the three works, into four sections, comprising 30 double batteries. In each section coal will be conveyed by a lift into a high hopper, and emptied into the loading-machine. The coke from the retorts will be carried by conveyors to waggons, boats, carts, or depôts.

Handling of Coke.—The annual production of coke being about half the weight of the coal distilled, it will be well to provide storage for half this amount—viz., 300,000 metric tons—on an area of about 200,000 square metres for works, if the stacking of the coke is made to a height of 4 metres on an average.

Gasholders.—Each works requiring storage for two-thirds of the maximum daily production of gas—viz., 450,000 cubic metres—there would be four telescopic holders of 110,000 cubic metres capacity per works.

Miscellaneous Plant.—M. Lauriol provides for a supplementary water-gas plant of about 170,000 cubic metres; but he would also construct a small special works, comprising pumps to supply the works with water, and electric power generators for all the operations connected with handling the coke, drawing waggons, working conveyors, coke and coal breakers, exhausters, compressors, &c. Finally, plant would be required to manufacture sulphate of ammonia at each works, but not tar, as now.

Mains.—Although the distance of the works from the city would be on an average 6 kilometres (3¾ miles), special arrangements would assure a pressure of 35 millimetres (1·4 inches), which would be absolutely necessary. For this purpose, the gas would be conveyed to the gates of Paris by mains 1·2 metres (4 feet) in diameter, two in number per works. The volume to supply per hour and main attaining as much as 40,000 cubic metres, the gas would be forced at an initial pressure of 500 millimetres (20 inches) by the aid of compressors. This would ensure a pressure much the same as that now existing in the large mains of the city.

Cost of New Works.—M. Lauriol estimates the cost of plant such as he has described as follows:—

	Francs.
Works proper	181,000,000
Supplemental pipes	7,000,000
Meters, branch-pipes, and rising mains	36,500,000
Supplemental meters, lamp-columns, &c.	15,000,000
	239,500,000

We may estimate at 15,000,000 frs. the share of the City in the assets of the present Company, if the existing works are not utilized. In the event of the City erecting new works, and not using those of the Company, a loan at least equal to the sum of the total expenses—viz., 239,500,000 frs.—would be needed, together with 250,000,000 frs. as a further guarantee.

Cost of Manufacture.—M. Lauriol considers the question of the working expenses per cubic metre of gas, if the present works are retained as they are or increased by new plant to meet the growth of consumption, or if new works are built. The following are his conclusions: As regards coal, whereas the present Company expend 6·61 c. per cubic metre of gas, the new works would only entail an outlay of 6·31 c. With regard to manufacturing expenses, the figures would be—

	Present Works.		New Works.
Heating	1·43c.	..	1·27c.
Labour	1·79	..	1·04
Maintenance	0·64	..	0·84
Purification and accessory expenses	0·53	..	0·53
	4·39c.		3·68c.

Distributing expenses would be the same in both classes of works—

Staff of workmen	0·92c.
Maintenance of pipes	0 51
Various expenses	0·28
	1·71c.

Indirect expenses are estimated in both cases as follows:—

General expenses	1·46c.
State expenses	0 33
	1·79c.

Receipts from bye-products would be—

	Present Works.		New Works.
Coke	4·58c.	..	4·48c.
Tar	0·50	..	0·50
Ammonia	0·59	..	0·59
	5·67c.	..	5·57c.

The miscellaneous expenses connected with meters, branches, interest on cash in hand, brick-works, &c., are estimated in both cases as follows:—

Meters and branches	0·20c.
Interest on cash in hand	0·19
Brickmaking, &c.	0·10
	0·49c.

Finally, as regards leakage, consumption of gas on works, extra supply for illumination, paid by the hour, &c., the figure of 7 per cent. now accepted can be continued.

M. Lauriol summarizes working expenses in both cases as follows:—

	Present Works.		New Works.
Coal	6·61c.	..	6·31c.
Manufacture	4·39	..	3·68
Distribution	1 71	..	1 71
Miscellaneous expenses	1·79	..	1 79
	14·50c.	..	13·49c.
He puts the receipts at—			
Bye-products	5·67c.	..	5·57c.
Various	0·49	..	0·49
	6·16c.	..	6·06c.
Net cost of gas manufactured	8·34c.	..	7·43c.
Allowance of 7 per cent. for loss	0·58	..	0·52
Net cost of gas consumed	8·92c.	..	7·95c.

The preceding table shows that the net cost of working per cubic metre would, with the existing works, be in future 8·92 c.; with the new works, 7·95 c. The figures given by the Gas Company for 1899 are 8·40 c. If the existing works are retained, but developed and modernized, these figures might be fixed at 8·6 c. Reckoning the capital expenses on various hypotheses, and leaving a sufficient margin, M. Lauriol arrives at 14 c. as the selling price per cubic metre of gas with all the plant to construct, and allowing no profit. The normal cost to private consumers, giving the Municipality similar profits to those now made, and also reckoning the special rate of 15 c. for municipal contracts, would be 20 c. Taking into consideration the present circumstances, which may place the existing assets in the hands of the city at reduced cost, and according as the reduced price is or is not anticipated, one of the two following combinations may be brought about; (1) 1902-1905, 30 c.; after 1905, 18 c. (2) 1902-1905, 20 c.; after 1905, 19·5 c.

Industrial Value of Existing Assets.—The cost of the new works, reduced to what it would be for a power equal to that of the actual works, is estimated at 150,000,000 frs. by M. Lauriol. The deficit on the existing works, compared with the new ones of equal capacity, would be 70,000,000 frs. This gives 88,000,000 frs. as the value of the former. Meters, branches, rising mains, &c., being estimated at 73,000,000 frs., the total value of the assets in kind appertaining to, or intended for, gas supply, would thus be 161,000,000 frs., half of which—viz., 80,500,000 frs.—the City would have to pay.

Contract Plans Presented.—Among the various schemes proposed for the settlement of this question, M. Lauriol only entertains that of M. Chamon and his colleagues and that of M. Gilbert-Boucher and those who are associated with him. However, he makes a few remarks on a new scheme brought forward by M. Sauton, who proposes that the Municipal Council should invite the Prefect of the Seine to officially present the following conditions to the Gas Company: The Company to give up possession of their works in 1906 to a new Company, at a figure which would be accepted by the City. They would still have to sell their assets in kind (branches, meters, rising mains, &c.); the produce from such sales, together with the cash in hand, to be equally divided between the Company and the City. The new Company would have sufficient capital to pay for the assets of the present Company handed over. The shareholders of the Company would have a preferential right in the shares of the new Company; the number of such shares being the same as now. The new Company would advance the money necessary to reduce the price of gas from 1902 to 1905. It would be repaid first by the sum received by the City at the end of 1905 from the sale of meters, &c., and next, from 1906, out of the future receipts. The undertaking would be conducted from that year by the new Company on a plan similar to the sliding-scale in operation in London. A special reserve would be formed to constitute a capital equal to that of the Company. The contract would end either when this capital, which would revert to the Company, was reconstituted, or ten years after the repayment of the sums advanced from 1902 to 1905; the City then supplying the requisite funds to reimburse the Company's capital.

Fresh negotiations and the drawing up of the new contract would require considerable time; and at present it is absolutely urgent to solve the question, and relieve the City from suspense. For these as well as for financial reasons, M. Lauriol prefers the Chamon plan, which comprises the purchase of the total actual assets of the Company, together with the available cash, &c., for 100,000,000 frs.; working for fifteen years with a farming company; reduction of price to 20 c. per cubic metre from 1902—the present arrangements being retained in other respects until the end of 1905; and, after 1906, the division of the profits between the Company, the employees, and the City, the last-named being at liberty to transfer some of their shares to the consumer. This

scheme assures the City an annual income of 18,000,000 frs., and the consumers a net price of 18 c.

M. Lauriol also considered the subject of direct municipal control of the gas-works—passing in review the chief examples of this system in France and abroad; and in his report, he demonstrates that their conditions of good working are not compatible either with the regulations or the laws governing the administration and finances of the communes. Supposing every facility were given to the City in this respect, the present very special situation—the fact that the City has every interest in becoming proprietor of the Company's assets—renders any arrangement for entering into possession of these assets more favourable. Consequently, M. Lauriol considers that, whatever reasons may be advanced in favour of Municipalization, they are not to be entertained. He is in favour of the adoption of the Chamon scheme; but as, when this has been accepted by the Municipal Council, it will have to be authorized by the shareholders of the Gas Company (and though they will probably sanction it, it is not certain, they will do so), the Municipality, in order not to be caught unprovided for, should lose no time in going through the requisite formalities for constructing new works. They should therefore apply to the Legislature not only for sanction to the Chamon scheme, but for power to raise a loan of 250,000,000 frs., guaranteed by the working profits, to construct new gas-works.

A MODIFICATION OF SCHILLING'S SPECIFIC GRAVITY TEST.

Herr F. Pannertz, Chemist at the Municipal Gas-Works of Crefeld, described in a recent number of the "Journal für Gasbeleuchtung" a modification of Schilling's apparatus for determining the specific gravity of gas.

With reference to it, he remarks that though the specific gravity of coal gas is of very limited significance, yet at many works where water gas is mixed with coal gas, the determination of specific gravity will prove useful in affording a check on the mixture. It may be carried out readily where there is not a fully equipped laboratory. But as the more modern apparatus for determining the specific gravity of gas is costly, Schilling's apparatus is still the one most generally used. In it, the measuring chamber is customarily cylindrical in shape throughout. This makes it difficult to read exactly the time when the column of water submerges the two marks; because the surface is fairly great, and the submersion occurs slowly. In order to reduce the uncertainty of this reading, Herr Pannertz narrows the measuring cylinder to about one-third its normal diameter at the places where the marks occur on it—as indicated by *a* and *b* in the figure. Thus the cylinder passes considerably more rapidly beneath the surface of the water at each of these two points, and the time at which the marks are submerged can consequently be read with greater precision. The marks at each constriction of the cylinder can be seen in the figure.

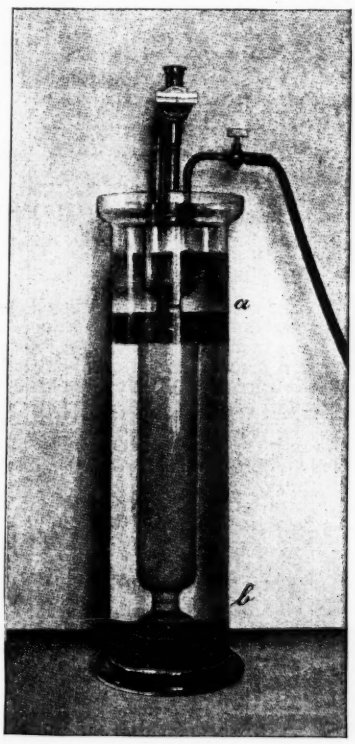


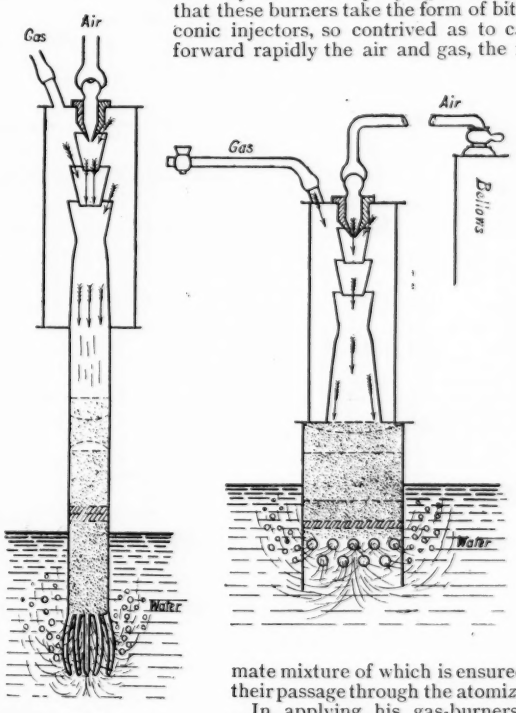
FIG. 1.

Further, Herr Pannertz puts on the outer cylinder, on the side farthest from the observer, a white strip reaching from top to bottom, and about one-fifth the circumference of the cylinder in width. This strip is interrupted, at about the height of each of the two marks, by black strips about 1¼ inches deep. These define the lower meniscus of the surface of the water so sharply that the time at which this meniscus passes over the marks on the measuring cylinder can be read with great precision. The strips may be made by applying oil colours to the outside of the outer cylinder.

Determinations of the specific gravity of the same gas may by these means be made repeatedly, according to Herr Pannertz, with a difference of only ± 1 in the third place of decimals in the result, which is all that can be desired for technical purposes.

BURNING GAS UNDER WATER.

In the "JOURNAL" for the 3rd ult., there appeared a "Note" giving particulars in regard to some experiments on a fairly large scale carried out by Mr. H. Nicholson with explosive mixtures of air and inflammable gas, burning them in a specially constructed burner under water. It was remarked at the time that this appeared to be a distinctly novel way of applying the heating power of gas to a liquid. We have since been informed that a similar object has been attained with the gas-burners constructed by M. Bandsept, of Brussels, to which reference has been made from time to time in our columns. The investigations carried out by M. Bandsept in connection with the combustion of gases have proved to demonstration that perfect combustion at the highest temperature is realized only when the exactly proportioned mixture of air and gas is formed or revivified *pari passu* with its arrival in the flame; in other words, the mixture must be atomized at the very orifice of the burner. When this is done, the flame is fed by gases which are about to undergo chemical transformation; and it develops, in a certain sense, independently of the medium by which hollow flames are produced. Consequently, it becomes possible to maintain combustion under water. The atomizing burners of M. Bandsept have the effect of making the last molecules of the gases take a whirling movement, which accelerates the flow of the mixture rendered homogeneous in its entire volume. The flames are thus reduced to their actually useful size, and their temperature is equal throughout. It will be seen by the accompanying illustrations that these burners take the form of bitronconic injectors, so contrived as to carry forward rapidly the air and gas, the intimate mixture of which is ensured in their passage through the atomizer.



In applying his gas-burners to the heating of liquids, M. Bandsept uses as motive power a jet of air from a bellows; and this jet is charged, at the outlet of each pipe, with gas kept at the ordinary pressure in a casing surrounding the cluster of cones. The mixture finally passes through the atomizer, which is situated at the bottom of the divergent pipe, where it is revivified at the moment it enters the flame. When it is desired to bring the burner into operation, the casing surrounding the cones is connected on one side with a gas service-pipe, and on the other with the injector of the bellows, as shown in the second diagram. The gas flows into the case, and is carried forward by the stream of air forced in, and the mixture is gradually produced. It can be easily ascertained, by the character of the flame, when the current is of the right composition. When this has been done, the end of the burner is inserted slowly into the liquid, and the mixture burns. A sheath of bubbles surrounds the flames, and forms the medium between the ignited gas and the water which is to absorb its heat. The mixture being constituted in such proportions as to allow of its being thoroughly burnt, the products of combustion pass into the liquid, and impart to it all their heat. It is absolutely necessary, however, that combustion should be complete at the extremity of the burner, as reactions would bring about dissociations which would lead to unsatisfactory results. The preservation of the flames in the liquid is due to the combined effects of the pressure of the gaseous mixture and the high temperature developed by its perfect combustion. The predominating influence in the phenomenon is, however, thermic action. The violent movement of the water round the burner is, therefore, in all probability only caused by heat. The immersed burner becomes a very simple calorometer; and it may be advantageously employed in many industrial operations.

THE USE OF LIME IN LIQUOR DISTILLATION.

The following is the substance of a paper on this subject, read by Herr E. Blum, of Berlin, before the Mid-Rhenish Association of Gas and Water Engineers, at its meeting at Giessen.

Ammonia is a bye-product of gas manufacture of much importance, as it forms a considerable source of revenue to the works. It is clearly economically important that the washers should be capable of abstracting the ammonia as completely as possible from the gas, that loss of ammonia should be avoided from liquor tanks and by volatilization from uncovered overflows, &c.; and, finally, that the spent liquor from the sulphate plant should be thoroughly exhausted.

The importance of care in the working-up of the liquor to sulphate may be readily shown by an example. A gas-works making about 350 million cubic feet per annum would, if the effluent or spent liquor of the sulphate works contained only 5 parts of ammonia per 100,000, sustain an annual loss of about 364 lbs. of ammonia—value (say) about £5 7s. But if the spent liquor contained 5 parts of ammonia per 10,000—by no means an exceptional quantity when old apparatus is used—the annual loss would be ten times as great, or in value about £53.

Given good distilling plant, the more nearly the lime is added in the proper ratio to the amount of ammonia there is to be extracted from the liquor, the better will be the result obtained. In most cases the milk of lime is introduced into the apparatus through a hand-pump, with which a given number of strokes are made at prescribed intervals, fixed according to the amount of liquor being dealt with at the time. At coke-oven works there are special clocks which give a signal when the time arrives for pumping; but, even with these, the addition of lime remains dependent on the care and conscientiousness of the workmen. In order to make it independent of the workmen, Debruck, of Düsseldorf, has adopted a means of operating the pump automatically by the agency of the water flowing away from the condensers. The water flows into a tumbling bucket, which is connected with the pump in such a manner that a stroke is made each time the bucket tips. The interval between the strokes can be altered by regulating the flow of water to the bucket. As water under pressure is not, however, always available, and is often costly, and as steam is in any case required for the liquor plant, an attempt was made to effect the addition of the milk of lime by means of a direct-action steam-pump. Such a pump, with cataract valve-gearing, was tried first at Messrs. Otto's works at Dahlhausen, and proved so satisfactory that, with the addition of a distributing valve, devised by the firm for the supply of a number of stills, it was afterwards supplied to many other gas-works, including Chemnitz, Bromberg, Leipsic, Posen, Stockholm, Berlin (the Imperial Continental Gas Association's and the Lichtenberg), &c., and many other ammonia works.

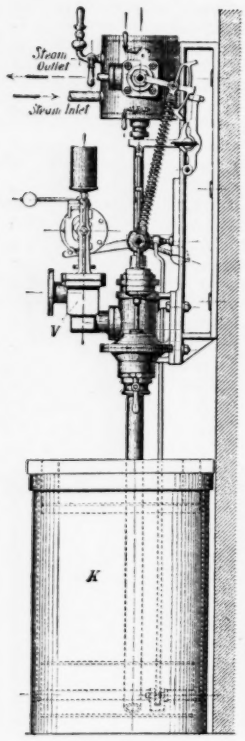


Fig. 1.

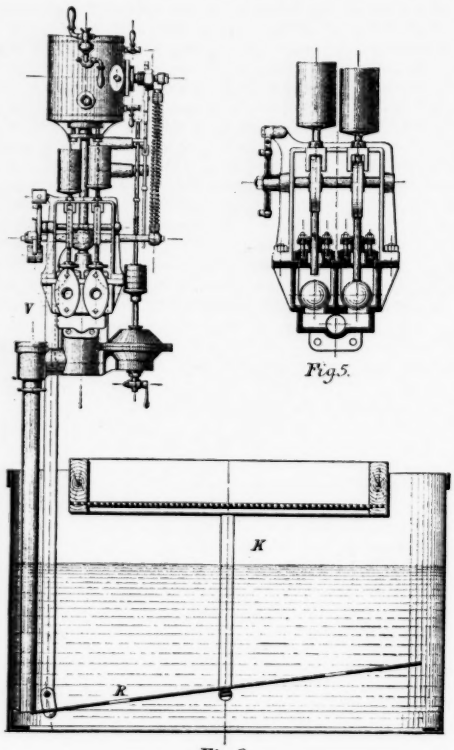


Fig. 2.

Fig. 5.

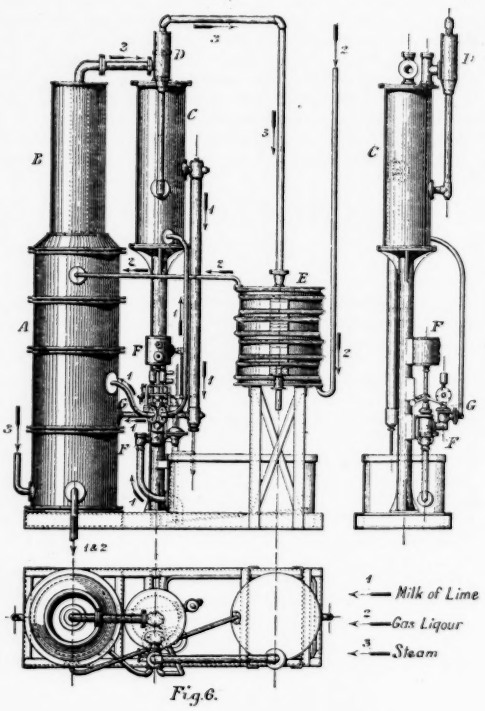


Fig. 6.

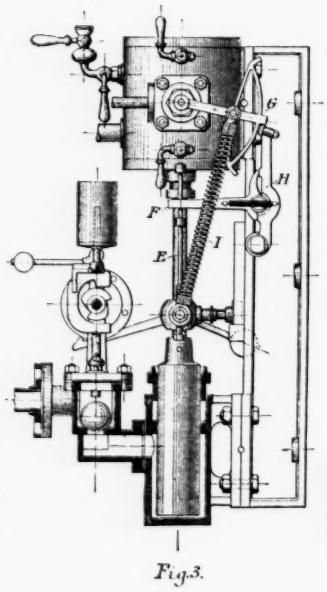


Fig. 3.

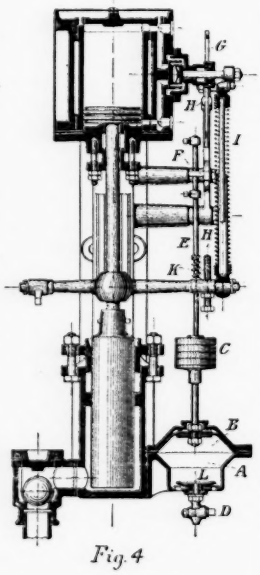


Fig. 4.

This pump is shown in figs. 1 to 5. In these K is the milk-of-lime tank; R, the stirring gear operated by the pump; and V, the distributing valve. The characteristic part of the steam-pump is the cataract gear. In the casing A is a rubber membrane B, which in the figure is shown close to the top of the casing. This membrane is lowered by the weight C when the tap D is open; and its descent occurs more slowly the less fully the tap is open. As the membrane falls, the rod E attached to it strikes the lever F, and depresses it. By this means, the regulating arm G, which was held by the lever H actuated by F, is liberated; so that the extended spring I can act on it, and thereby open the steam admission port to the cylinder. The plunger is thus raised, and so moves G, through the levers F and H and the spring I, that the steam admission is cut off at the right moment. At the end of the stroke, the peg K raises the lever F, whereby the regulating arm G, held by H, is again liberated, so that it can force upwards the extended spring. By the ascent of the plunger, the membrane of the cataract is again raised, and air is drawn into the casing A through the valve L. With the descent of the membrane, the operations described commence again. The number of strokes made can be regulated within wide limits by altering the position of the tap D.

The distributing valve, shown in fig. 5, contains as many chambers—each supplied with a ball-valve—as there are different sets of apparatus to be supplied; one chamber being appropriated to each set. The balls of the valves are kept down by the weight,

except the one in the chamber which is connected with the set to be supplied with milk-of-lime. The balls in the different chambers are set free by the transmission of the movement of the plunger to a toothed wheel having teeth corresponding to the number of chambers. The illustration sufficiently explains the way in which the appliance works.

The distributing valve becomes of special utility in cases where concentrated gas liquor is produced. The concentrated liquor, as is well known, is made by condensing the vapours of ammonia as expelled from the still, in a cooler. As a rule, the product is not made with more than 15 per cent. of ammonia in it. But a patent carbonic-acid washer, inserted between the still and the condenser, admits of concentrated liquor of much higher strength being obtained. At the Schlieren works, at Zürich, an average of 23·5 per cent. of ammonia in the concentrated liquor was thus obtained over a year; and at Lichtenberg, near Berlin, 25 per cent. Evidently this strong liquor can return a higher price to the works whenever it has to be forwarded to a distance than the weaker product, as carriage has to be paid on so much more water in the case of the latter.

The mode of working with the carbonic acid washer, which is at a high level, is to introduce into it milk of lime, which removes the carbonic acid from the vapours issuing from the distilling apparatus. The lime becomes completely saturated, and the quantity used corresponds with the amount of carbonic acid removed from the gas. Thus liquor containing more or less carbonic acid may be made at will. The water, mixed with carbonate of lime, flows from the washer into the distilling plant, and milk-of-lime is added in the requisite amount for liberating the fixed ammonia. By the use of the distributing valve the alternating supply of lime to the carbonic-acid washer and to the distilling plant can be effected automatically in the proper proportions, corresponding to the composition of the liquor which is being worked up. It is easy, by dividing the toothed wheel accordingly, to supply the milk-of-lime to the washer and the distilling plant in the relative proportions of 3:2 or 4:3 or 5:3, &c., as desired. The pump in the last example (for instance) feeds the washer during five strokes, and the distilling plant during the next three strokes.

The method of arranging the pump in conjunction with a small concentrating plant, which works up 660 gallons of liquor per 24 hours is shown in fig. 6, in which A is the distilling apparatus; B, the reflux condenser; C, the carbonic-acid washer; D, the lime catcher, which serves to stop any lime carried up; E, the condenser in which the vapours are condensed; F, the steam-pump; and G, the distributing valve. The whole plant is constructed so that only a short time is required to erect it in position. It is necessary that regularity and uniformity should be observed in the flow of liquor, the pressure of steam, and the addition of lime.

The inflow of liquor is regulated by sending it through an apparatus with a float for maintaining a constant head; while the quantity is exactly measured by means of a tipping vessel with a clockwork recorder. The pressure of steam is regulated, and kept constant, by means of a pressure-reducing valve. The milk-of-lime is always mixed to the same strength (10° Beaumé) before it is pumped. A counter attached to the pump enables the number of strokes made to be seen at any time. The inflow of liquor and the number of strokes of the pump must be kept in a certain proportion, which must be fixed from tests made before starting work.

The steam pump makes, say, two or three strokes per minute at definite intervals—thus stirring up the milk-of-lime, and preventing deposition of carbonate in the pipes. When it was not employed, the workman had to make thirty to forty-five strokes with the hand pump every quarter of an hour—thus introducing at once the whole of the milk-of-lime required for that period. The attention needed to be given to the plant has been so much reduced by the introduction of the steam pump, &c., that one man can look after it and do other work also. Thus the wages become much diminished, and many small works which have hitherto found it difficult to obtain any return from gas liquor, can secure considerable sums by working it up. When the liquor is worked up on the spot, it is not so important to make it of high strength as when it has to be sent to a distance.

The method of preparing concentrated ammoniacal liquor and the apparatus therefor, described above, afford to works of medium and small size the power of securing more favourable returns from their gas liquor.

In the use of the wet and dry bulb thermometer for determining the pressure of aqueous vapour in air, considerable uncertainty is introduced by the presence of a constant which varies according to the conditions under which the thermometers are placed. The extremes are represented by August's formula, which supposes the air round the bulbs to be constantly changing, and Maxwell and Stefan's result, which is calculated on the hypothesis that the water on the bulb is evaporating and its vapour diffusing into an infinite mass of quiescent air. We learn from "Nature" that Signor G. Guglielmo proposes to eliminate the arbitrary constant by the use of a third thermometer, the bulb of which is wetted by an aqueous solution whose vapour tension differs considerably from that of pure water. In this way a further equation is obtained, and the unknown constant is eliminated.

MECHANICAL SEPARATION OF GASES.

The Mazza Apparatus.

Readers of the "JOURNAL" are doubtless acquainted with the principles on which are constructed machines working by centrifugal force, and are probably familiar with some of their many successful applications—notably in the separation of liquids of different densities, and the removal of impurities, especially micro-organisms, held in suspension in water. A machine of this class, to which their attention has been already directed in these columns, is that devised by Signor Mazza, primarily, we believe, for the superoxygenation of atmospheric air, but applicable to the purification of gas. Very shortly after our last reference to the apparatus, application was made for some particulars in regard to it, for which we had to refer our correspondent to Signor Mariani, Chief Engineer of the Turin Gas-Works, who had witnessed some experiments made with it. They were carried out early last year at the works of MM. de Dion and Bouton, at Puteaux, in the presence of M. Guillet, and also at the Turin works, with the assistance of M. Pierre Guédon—both gentlemen being engineers. The apparatus was brought under the notice of the Society of Industrial Chemistry of Turin in a lecture delivered by Signor Mazza on March 3, 1900; and a short account of it was given in "La Chimica Industriale" on the 15th of April and the 15th of July following. Extracts from this lecture, from the text of Signor Mazza's French specification, and from Signor Mariani's statements, recently appeared in the "Revue Industrielle;" and we have translated the portions which appear to meet the requirements of those who have manifested an interest in this subject. The construction of the machine is shown in the accompanying illustrations. Fig. 1 is a reproduction of the drawing deposited by Signor Mazza with the application for his French patent; fig. 2 represents the apparatus with which the experiments were made at the works of MM. de Dion and Bouton.

It will be seen by fig. 1 that the appliance consists of a revolving drum AA, having a shaft BB passing lengthwise through it, and projecting at either end, and fixed to the drum by means of several diaphgrams DD′D″ (shown in the sections), so as to secure rigidity. The drum is closed at the lower part, with the exception of a central passage P, through which the gas enters. The diaphragms divide the drum into a certain number of chambers of the same depth as the drum. At the top part of the apparatus there are compartments CC′, concentric and fixed; their number varying with that of the constituents of the mixture to be separately collected. If the shaft is now made to rotate with sufficient rapidity, the drum and the diaphragms, by their rotation, produce towards the centre of the drum a certain rarefaction, which draws the gaseous mixture through the central conduit P. On coming into contact with the diaphragms, the mixture is violently driven by them towards the drum, and also to the upper part of the apparatus; so that separation is completed when the mixture reaches the top, and the gases are collected in so many concentric rings, according to their density—the heavier passing out through the openings *aa′*, and the lighter by the openings *dd′*.

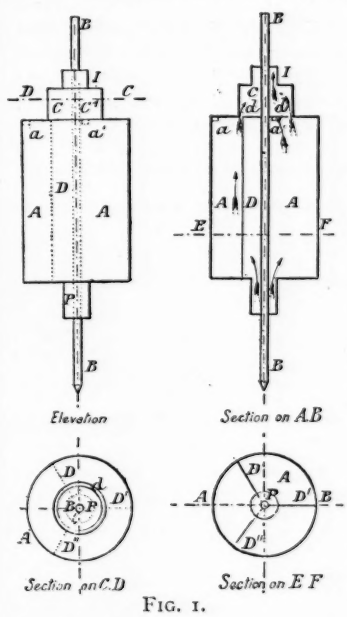


FIG. 1.

Signor Mazza enumerates a certain number of applications of his apparatus—for example, the extraction of hydrogen from illuminating gas, either to increase its photogenic power or with the view to the manufacture of commercial hydrogen; the purification of gas; the superoxygenation of air; and the removal of solid substances (tar, ashes, mineral or fluid particles, cyanogen, carbonic acid, and hydrosulphuric acid) from gases. Finally, he points out that the shape of the apparatus makes it an economical ventilator; the impinging surfaces being reduced to a minimum. He remarks that it is a well-known law in mechanics that the resistance of fluids to substances impinging upon them varies with the square of their speed for equal surfaces. The more the impingement surface of the bodies and gases is decreased, the lower should be the power needed to perform a given amount of work. In the compressor extractors now employed, the impact of the gases against the blades takes place upon the two lateral surfaces, as well as on the ideal exterior envelope of the blades. In the Mazza machine, on the contrary, in which diaphragms are employed, instead of blades, to attain the same object—viz., to give the gaseous molecules a rotary motion—the gas is struck

only at the inlet and outlet orifices, which have been exactly calculated. During all the rest of its motion inside the drum, there is merely a movement in the direction of the axis, and a gliding over the exterior surface of the drum.

Fig. 2, which is taken from the report of Signor Mazza's lecture at Turin, represents, as already mentioned, the arrangement adopted in the experimental machine tested at Puteaux. The object was to increase the heating power of the gas from Pierson generators by extracting some of the carbonic acid therefrom. The movable drum B revolves round a shaft A, to which are fixed the diaphragms DD (not very well shown in the illustration), arranged like those in fig. 1. The movable drum is placed inside a fixed cylinder S, terminating at the top in a truncated cone, and resting at the bottom on a water-tank V. The gases to be treated arrive by the lower part of the apparatus through a central opening P, and at the top part of the drum are separated according to their respective densities by the holes dd^1 in the plate CC^1; the lighter gases being collected by the conduit I, and the heavier ones passing out through openings aa^1, mingling in the space between the cylinder and the movable drum, and flowing away by the conduit F.

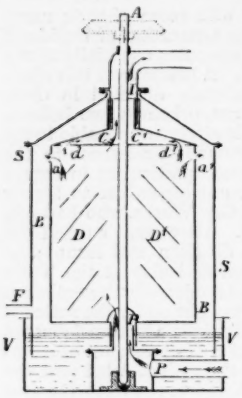


FIG. 2.

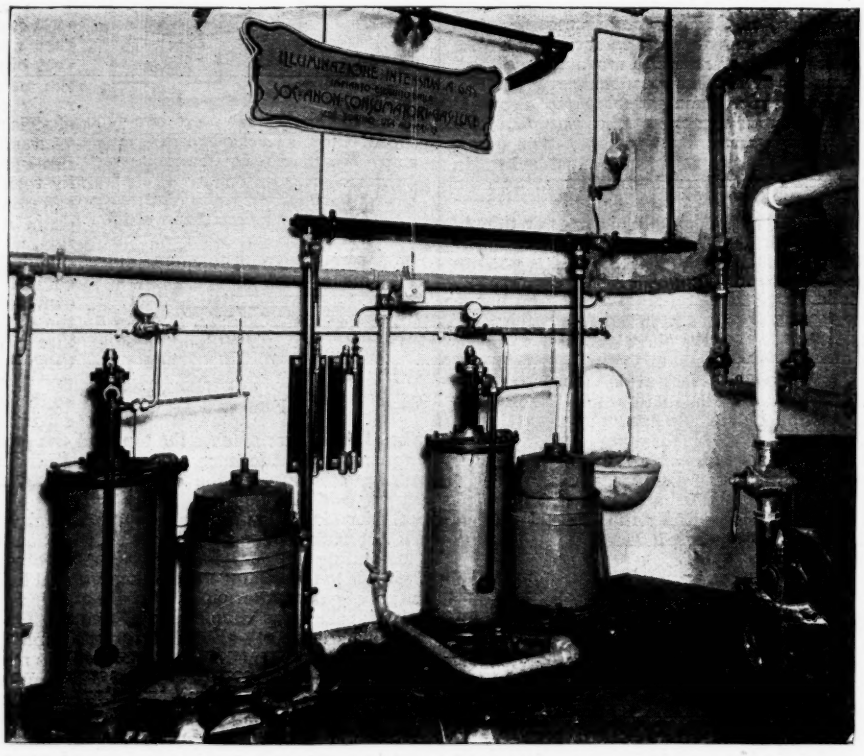
The drum employed at Puteaux was 32 inches in diameter and 5 ft. 3 in. high. It rotated at the rate of 340 revolutions per minute; and at this comparatively slow speed all the sulphuretted hydrogen and about 75 per cent. of the carbonic acid could be extracted from poor gas. Nearly 3000 cubic feet of gas were treated per hour. In his lecture, Signor Mazza made reference to the results he had obtained at the Turin Gas-Works with the same machine running at 650 to 675 revolutions per minute. Atmospheric air was superoxygenated, and the samples taken indicated, with the pyrogallate of potassium test, a proportion of oxygen ranging from 24·6 to 25·5 per cent. The density test, however, would have shown 33 per cent. Signor Mazza considers 29 per cent. about the probable quantity, which is as near as may be the arithmetical mean of the figures given above. With regard to the expenditure of energy, he allows one horse-power-hour for the production of about 6400 cubic feet of air enriched to the extent of 29 per cent.

The experiments at Puteaux were carried out under rather unfavourable conditions, with a roughly-made machine. The shaft, which was too small, was subjected, even when running slowly, to great jolting, which made it out of the question to think of increasing the speed. The gas to be treated contained nearly 50 per cent. of nitrogen, and it was very heavy, so that the complete removal of the carbonic acid was difficult. Whether this acid did not appear to be a very important bye-product in the manufacture of producer gas, or whether the sulphur compounds present made its utilization difficult without previously subjecting it to chemical purification or absorbing it by potassium, as is done in all cases where it is manufactured commercially, Mr. Pierson (who assisted Signor Mazza in the experiments) did not consider that the results obtained would justify the employment of such machines as the one under consideration, which would require an expenditure of motive force somewhat in excess of that indicated by the designer.

Since the Puteaux experiments, Signor Mazza has made a series in England, with the view of producing carbonic acid on an industrial scale. He was successful in extracting a considerable quantity of this acid from combustible gases; but the presence of sulphur compounds carried along with it militated against the employment of centrifugal power for its manufacture on a commercial scale.

KEITH'S HIGH-PRESSURE GAS-LIGHTS IN ITALY.

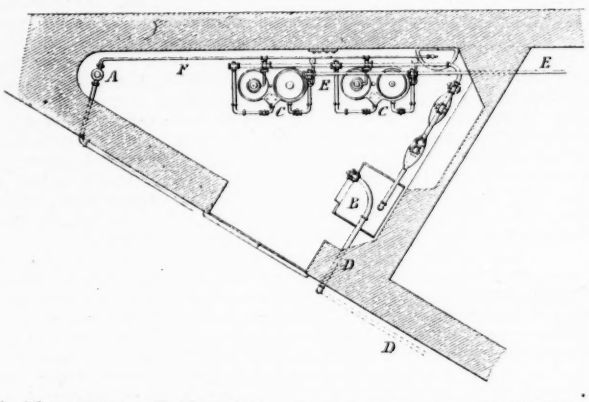
The officials of the Turin Gas Company (Società Consummatori Gas-Luce) have been taking a considerable interest in the subject of high-pressure gas lighting; and so pleased are they with it, that they have been freely advocating its adoption. The satisfaction given by the first installation was great; and the Company can now point to half-a-dozen plants, all doing duty in a manner which excites a large amount of admiration, and has obtained for them favourable and interesting reports in the local press. "Il Monitore di Affare," for instance, remarks on the attractiveness of the display of high-pressure lighting to be seen at the Gas Company's offices, and elsewhere in the city of Turin, and says that the system is worthy of every attention by gas users. No better means than these are required to combat successfully the powerful rivalry of the electric light, as by them, is also obtained, from the ordinary incandescent mantles, far greater illuminating



effect than formerly was possible, and that, too, at half the cost. The local commercial paper, after mentioning details of the burners used, expresses indebtedness to the Società Consummatori (which is formed on a co-operative basis), and notes the keen and continual struggle between the two principal illuminants. It welcomes the now increased competition, which, it says, is "the soul and irresistible spring of all true progress." This being so, we are expecting to hear of greater things being done with the system in Turin ere long. To Keith's patent compressors and high-pressure burners, the Company have given preference.

One of the latest installations is at the beautiful Victor Emanuel Theatre; and a better place than this the Company could not have secured for making known the merits of the new method of lighting. We have been supplied with a photograph

and a sketch plan of the compressor-room; and the reproductions illustrate the character of the work required for an installation of the size here described. The photographic view shows two of Keith's patent No. 3 compressors, worked by the ordinary water service, and capable of supplying 100 burners. The com-



A. Water-meter. B. Gas-meter. C. Gas-compressors. D. Gas-inlet
E. Gas-outlet. F. Water-inlet.

pressors are fitted with compensating gear, for enabling them to work together, and to equally share the labour. Sixty of Keith's patent high-pressure burners are fixed throughout the theatre; and these consume 600 cubic feet of gas per hour, and give a light equal to a total illuminating power of 18,000 candles.

THE PHYSICAL PRINCIPLES OF ILLUMINATION.

At the Meeting of the Department of Physics of the Brooklyn Institute of Arts and Sciences on the 19th ult., a paper on the above subject, dealing specially with recent methods of lighting, was presented by Mr. DOUGLASS BURNETT. The communication appears in the number of the "American Gaslight Journal" for the 23rd ult., from which we make the following extracts.

The frequent reports of improvement in methods of lighting make it desirable to review the basic scientific principles applied in the art, in order to correlate existing methods and look into the possibilities of future development. While we are still far from understanding the chemical and physical reactions in even ordinary flames, fundamental principles seem simple; but this may be due to superficial study and failure to apply more than general terms. Thus, incandescence is used as describing any property of emitting light, except fluorescence and phosphorescence, included in the more general term luminescence. The very beautiful and recondite effects studied under these latter heads have probably led scientists to ignore the simpler and more practical problems of incandescence which we are to study this evening, with the result that scientific research is seldom directed towards a solution of the physical problems which worry the lighting engineer who is getting to be a specialist.

For our purposes, we may dismiss these purely scientific phenomena by definitions. Fluorescence is a property possessed by certain liquids, such as some oils, and by a few solids, such as fluorspar and quinine sulphate, of emitting light of a characteristic colour when exposed to white light; and phosphorescence is a property possessed by some solids of emitting light of feeble intensity after exposure for a sufficient time. There is no name I know of applied to gases which are never incandescent in the ordinary sense, though they emit light at the temperature of flame and when under excitation by an electric current. Luminescence involves only physical phenomena; incandescence, both chemical and physical. From that standpoint, it is doubly interesting. Further, incandescence involves the production of heat as well as light; in fact, the light is usually produced by the heating of a body or a set of particles to a temperature of more than 525° C. The spectrum of an incandescent body is always continuous, like sunlight, and the relative brightness of the various colours increases from the red end to the violet end as the temperature increases—the red preponderating at low temperatures, and the violet at high; and it may be accepted as generally true that the whiter the light the higher is its temperature. On the contrary, the spectrum of light from luminescent bodies is usually split up into lines or bands.

A method of comparing the temperatures, and hence the efficiencies of various sources of light, is by means of their intrinsic brilliancy—defining the amount of light emitted from a unit surface. For instance, we have the following figures showing the candle power per square centimetre: Argand gas-burner, at 1800° C., 0·3; Siemens regenerative burner (one of the brightest gas-lamps), 0·38 to 0·6; electric incandescent lamp, 40; Nernst electric lamp, 100; crater of an open arc lamp, at 3500° C., 6400. For ordinary cases, we may say that a square inch of gas-flame emits 4-candle power, whereas for the crater of an arc lamp the *pro ratâ* figure is 42,600-candle power.

As means for increasing the temperature are provided, a light becomes brighter—that is, the percentage of light energy to total light and heat energy increases. This ratio is called the "optical efficiency," and is as follows, in some instances: Argand oil-lamp 2½ per cent.; naked gas-flame, 5 per cent.; electric incandescent lamp, 6⅓ per cent. at 3 watts per candle; Nernst electric lamp 13 per cent. at 1 watt per candle; burning magnesium, 15 per cent.; 5000-candle power arc lamp, 25 per cent.; sunlight, 25 per cent.; the light of Geissler tubes, 33 per cent.

One of the methods of increasing the temperature is to construct the lamp to avoid waste of heat. The greater efficiency of the incandescent electric lamp as compared with gas-flames is partly due to the absence of loss from convection, as the filament is in a vacuum, and to the small loss of heat by radiation and by conduction through the leading-in wires. Another reason is that the amount of electric current energy adjusts itself automatically to the dimensions of the filament; while in a gas-flame there is no method of adjusting the quantity of the carbon particles so as to use up all the heat-energy supplied. The high efficiency of the arc lamp results from the use of the electric current over a very limited surface called the crater.

Having granted the previous considerations, we are in position to assert that the object in artificial lighting must be: (1) To increase the temperature of the light-source in order to increase the whiteness and purity of the light; (2) to decrease the losses of heat in order to increase the efficiency; (3) to adjust the quantity of the luminous substance to absorb the greatest amount of heat at the highest temperature; (4) to select a substance to be rendered incandescent, having maximum emissivity; and (5) to extend the luminous substance in such manner as to give the greatest amount of diffusion to the light.

The method of increasing the temperature most generally used has been the admixture of air with the gas before burning, and in definite proportions, as first pointed out by Davy and Bunsen. By the use of pure acetylene, the quantity of solid material deposited in a flame (and consequently its light-giving qualities) is increased, though acetylene does not enrich illuminating gas. Attention to requirements and available methods has enabled an improvement to be made in the duty of gas, measured by the gas engineers as the candle power per cubic foot, as follows: Naked gas-flame, 3; London standard argand burner, 3·2; Clamond burner, 4·26; Siemens regenerative burner, 4·77; result of a comprehensive test of Welsbach burners, 5·5 to 33; Sugg's incandescent pressure burner, 22 to 32; claimed for the Kern burner, 25; pure acetylene, 84.

In the burning of magnesium, the intense brightness results, not only from the whiteness of the metallic oxide formed, but also from the great quantity of that oxide contained in a flame of unit volume as compared with a corresponding flame in which carbon particles are rendered incandescent. This is shown by its dense smoke, consisting of pure magnesium oxide, which is solid, while that of carbon is a gas. The flame temperature is 1400° C., or about 400° C. less than that of an ordinary gas-flame.

This reference to the use of solid magnesium oxide as the illuminating agent brings us to the principle underlying recent methods of lighting, of which the Welsbach system is typical. Many years ago, it was noticed that, when the intensely hot flame produced by the burning of oxygen and hydrogen in the proportion required to form water, was allowed to impinge upon a mass of lime, an extremely brilliant light was the result. It is only recently that the efficiency has been improved by reducing the mass of the substance against a portion of which the flame was allowed to impinge, from a weight of several ounces to a fine fabric or network of material, weighing but a few grains, suspended over the flame, and covering its surface at the point of combustion, and consequently of highest temperature. The efficiency of the oxy-hydrogen lamp was formerly ascribed to the temperature of the flame—the highest of any known. But some additional reason for the great luminosity must now be assigned, and this is found in the catalytic property of certain of the rare earths.

For purposes of comparison, we may assume that a Welsbach mantle consists of a lacework upon which there has been deposited, by dipping into a solution, the oxides of thorium and cerium in the proportion of 99 to 1 per cent., and that the lacework has been burned away by the application of heat, leaving a fabric of the oxides of the two rare metals stated. If heat be applied to a similar mantle of either of the two oxides alone, the light given out will be faint in comparison with that given by the combined mantle in the proportions stated. It has also been found that if the oxides, in the required proportions referred to, are heated to an equal extent in a vacuum—as, for instance, under the intense heat of electric cathode rays—only a small amount of light will be emitted. It is therefore evident that oxygen is lighting such a mantle, and also that the oxides must be in about the proportion stated. Other substances with similar illuminating power are the oxides of chromium and aluminium.

The explanation of the intense light of the Welsbach burner is found in the fact that probably many millions of times a second there occurs "an alternate oxidation and reduction of one of the two oxides, with the corresponding formation and decomposition of the alloy of both oxides," and thus the heat of combination of the unstable oxide, added to the temperature of the flame, produces the higher temperature and increased illuminating power. The temperature of a Welsbach mantle is estimated at from 1800° to 1915° C., or somewhat in excess of that of a gas-flame. Another reason for the increased efficiency of this type of burner

lies in the much greater quantity of incandescent material available. There are about 4 milligrammes of cerium oxide present, as compared with 0·1 milligramme of carbon in a gas-flame; and the result is an increase from 16 to 80 candle power.

A more recent development along similar lines is that of the Nernst electric lamp, although the phenomenon of its lighting power is further complicated by some electrolytic action. Fundamentally, the lamp consists of a rod having the colour, hardness, and mechanical properties of porcelain, and made up of the oxides of some of the rare earths similar to those in use for Welsbach mantles. I understand that in America zirconium is principally employed; and it is worthy of remark that this metal was early abandoned by the incandescent gas-lighting people in favour of more active materials such as those already mentioned. For purposes of distinction, the rod has been called a "glower." At ordinary temperatures, it is a non-conductor; but after being heated to just above the limit of visibility, it becomes conducting, and will be incandescent to a point depending upon its dimensions.

In practical use, the Nernst lamp has also an auxiliary heating device, consisting of platinum wires embedded in cement, and in close proximity to the glower, used to bring it to a sufficient temperature, after which an automatic cut-out, consisting of a magnet and its armature, operates to disconnect the heater, and throw the full current into the glower, whereupon it flashes into full brilliancy. Close regulation is required, and is furnished by means of a "ballast" consisting of an iron wire contained in an exhausted glass globe; its function being to counteract any augmentation of current in the glower by an increase of its own resistance. The efficiency of the best electric incandescent lamps is commonly expressed as about 3·1 watts per candle, and of the arc lamp as about 1 watt per candle—the figure in the latter case referring to the mean spherical intensity. That of the Nernst lamp is about 1½ watts per candle, and therefore about twice as great as that of the best electric incandescent lamp, but not so good as the arc lamp.

Both the Welsbach and Nernst lamp developments indicate that we are approaching an era in which lighting may be practically produced, not primarily by the combustion of a simple element, such as carbon, in a gas such as the oxygen of the ordinary atmosphere, but when the substance producing the light will contain the oxides of elements, and perhaps exclusively of the metals, of the rare earths.

We are fortunate in possessing an application of Geissler tube lighting, which is the highest in efficiency of all artificial sources of light—I refer to the Cooper-Hewitt vapour lamp. Its essential principle is that of passing an electric current at the usual lighting voltage through a conducting vapour of metallic mercury, the pressure and properties of which are such as to bring the conducting power up to a high point. While the efficiency of such a light is no doubt very high, the colour is so rich in the rays of the mercury spectrum, and is so little influenced by the introduction of extraneous substances such as nitrogen, which would furnish the remaining colours making up white light, as to produce effects in ordinary application which are startling, if not ghastly. It is therefore to be feared that the vapour lamp, while very efficient and entirely applicable to existing circuits, has colour objections which will render its use impracticable.

We have seen that the electric arc lamp is the most efficient of all artificial sources of light, and that the efficiency of an incandescent lamp is great because of the very small size and weight of the filament and its maintenance in a vacuum, as well as because of the useful application of all the heat furnished by the electric currents. The use of metallic osmium may still further increase this efficiency. Otherwise developments are likely to be in the direction of the Nernst lamp, which combines the convenience and good colour of existing electric incandescent lamps with the higher efficiency of the arc lamp.

The present tendency of gas engineers is to improve the heat-giving quality of gas, which now averages about 600 B.T.U. per cubic foot, if necessary at the expense of its illuminating quality. This results not only from the more extensive use of heating and cooking appliances, but also from the fact that gas is getting to be very generally used in connection with Welsbach burners, requiring a flame rendered hot and colourless by the admixture of air. It is fair to state theoretically that in a city gas system using entirely Welsbach lamps, and also furnishing heat or cooking and power, there is no necessity for the illuminating quality of gas.

A NEW STOVE AND A NON-LIGHTING BACK BURNER.

In a new stove named "The King," the Wright and Butler Manufacturing Company have made a successful departure from the ordinary type of gas-heating fires. In outward features there is not much to chose between this stove and many others of high-class make and finish; but it is in the structural details which have been introduced to produce certain effects, and to obviate certain defects which are occasionally met with, that its commending merits will be found. The stove is of the condensing type; and in this respect it is somewhat novel, as will be presently seen. But, although of the condensing type, the firm have aimed at obtaining for the fire the appearance of an ordinary grate. Simple indeed are the means by which the makers have accomplished the building of the stove so as to admit of disconnection and separation of parts. The fire balls are contained in what may be described as a basket, which, on removing the two side dogs can at once be lifted out. Then in front of and under the fire is a bright copper hearth, which forms a strong reflector, and which is surrounded by a neat-looking fender. In the centre of the hearth is a grating, which covers a water vaporizing pan. The dogs, fire, fender, grating, and water-pan can all be separated without even so much as having to take out a single screw. One of the modern aims of gas-stove manufacturers has been to so construct their stoves that the operating portions can be readily taken apart for repair and cleaning, without causing a nuisance to the user; and certainly, as one looks at this stove, it is difficult to see to what further lengths the makers can go in this direction. There are two condensing-tubes—one on either side of the stove, and these are cast on to the back, which again is affixed to the main body in such a way as to be easily removed should occasion require—indeed, there is nothing in the stove which can become defective without being readily remedied with the minimum of trouble. The combustion chamber is at the top of the stove, and the condensing chamber at the bottom; and it is the water of condensation that supplies the pan already referred to as being situated under a grating in the front of the stove.

The non-lighting back burner is another distinctive point of this stove. It is constructed in three sections, each section being controlled by its own tap, situated at the top of the fender. By this arrangement, one-third, two-thirds, or the whole of the burner can be used as the temperature of the room and the comfort of the occupants demand. The non-lighting back virtue of the burner is secured by a simple application of the principle of the Davy lamp. The introduction of wire-gauze in stove burners with the same object in view is not by any means new; but the position in which the gauze has been applied has not always been the best to obtain a permanent, favourable effect—for example, as in those cases where the wire gauze has been situated just under the burner nozzles, and has been exposed to, and consequently has become choked by, the detritus from the fire balls. By referring to the illustrations (figs. 1 and 2), the method of construction will, with a few words of description, be understood. In fig. 1, it will be seen that there are two distinct injector-tubes. Midway between the two in the centre of the wire gauze (illustrated) is a partition. The small spaces between the orifices and the partition are covered by the wire gauze. Now fig. 2 illustrates the connection of the part described with a burner; and it will be at once observed that the wire gauze (over which is the mixing chamber) is entirely out of the direct influence of the burner proper. Tests have proved to us that the claims of the makers, in the matter of reliability against lighting back, are not by any means over-stated.

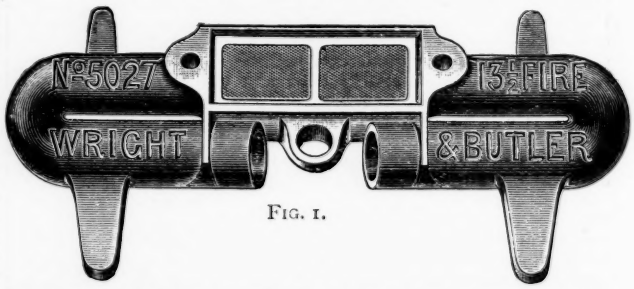


FIG. 1.

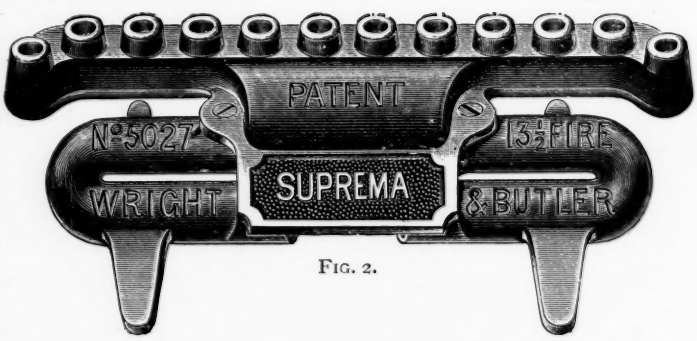


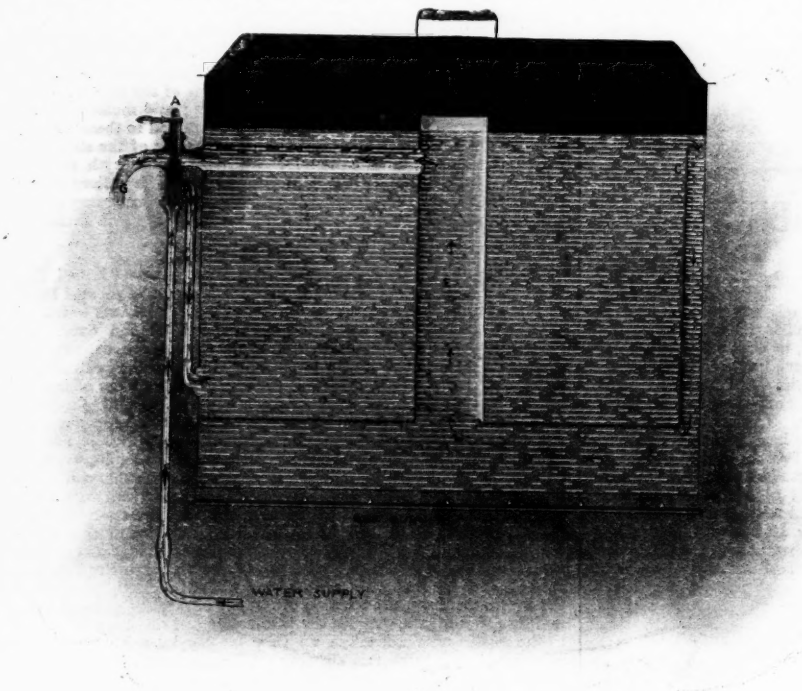
FIG. 2.

Now returning to "The King" stove, the consumption is about 15 cubic feet per hour when in full use; and judging from the heat which the fire emits, there is no doubt that a good value is obtained from this consumption. The stove has, within the past few days, been added to the exhibits of Messrs. Wright and Butler at the Crystal Palace; and those who may see it there or elsewhere will agree that it certainly ranks well among its competitors in points of excellence.

A COOKING-STOVE WATER-HEATING ATTACHMENT.

In our first notice of the Gas Exhibition at the Crystal Palace, we mentioned the co-optation by the Richmond Gas Stove and Meter Company, Limited, in connection with gas-cookers, of Parish's patent self-filling boiler, and promised a brief description of it in an early number. Where gas-cookers are established, the question of obtaining hot water for use in the kitchen with a minimum of trouble has been one of some little concern to those who have dominion over the culinary department of a household. Any device to be regarded as efficient in meeting the want must have an automatic feed; and this the boiler shown in the illustration possesses. It will be seen that the boiler is partitioned near the bottom into an upper and lower chamber—the latter being the one from which the hot water is drawn. It is fed with water from the chamber above through the pipe shown on the right-hand side; and when the gas-jets (which are situated under the boiler) are lighted, the heated water rises up the central shaft, and is drawn off from the top. There are two burners under the boiler, and one or both can be used as necessity requires.

As already stated, the boiler is self-filling; the supply being regulated by a duplex tap, the turning on of which liberates the hot water, and admits a corresponding supply of cold water. It will be observed that the designer has had in view the necessity, in order to keep the supply of hot water constant when the boiler is in use, of not admitting the cold water direct to the hot-water chamber; and the construction is such that the water must become warmed before obtaining admission to the latter. The cold water entrance, it will be noticed, is situated on the opposite side to the inlet to the hot-water chamber; it is also close to the hottest or lower part of the boiler, while the admission to the hot-water chamber is at the top. Besides this, the partition dividing the chambers, as well as the central shaft, impart a certain amount of heat to the supply storage. Therefore, in its passage from one side to the other, the water cannot escape becoming warmed.



A clearer idea of the action of the boiler will be gathered by an allusion to the reference letters in the illustration. The turning of the handle A creates two openings, allowing water to enter at the point B, and at the same time permitting hot water to flow from the point G. The feed water overflows at C, passing into the false bottom D, where it is heated. The hot water rises to the surface up the cylinder E, flows along the pipe F, and passes out at the opening G—the entire circuit being established by the one turning of the handle A. The boiler simply rests on a detachable shelf at the side of the cooker; and the whole arrangement can be readily removed. The hot water can be used freely for any purpose; the boiler being constructed entirely of copper, tinned inside.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Profit Sharing v. Trade Union Domination in Gas-Works.

SIR,—In the discussion in "The Times" on "The Crisis in British Industry," statements have been made by Mr. Geo. J. Wardle that should be prominently noticed in the "JOURNAL."*

The writer of the special articles in "The Times" drew attention to the fact that carbonizing wages per ton of coal are much less here than "in the case of London Companies which have not thrown off the Trade Union yoke." To this, Mr. Wardle, on Dec. 28, replied: 'Now, what are the facts? I have made inquiries at the Gas-Workers and General Labourers' Union Offices, and I am informed that in no London Gas Company are the Union men a determining factor. Neither at Beckton, King's Cross, nor Fulham has the Union got sufficient members to interfere with the policy of the management, if it wished to do so; and, as a matter of fact, they have never attempted to enforce the 'go easy' policy anywhere, or countenanced it in any way." In another letter, on the 2nd of January, Mr. Wardle says, in reference to the domination of the Union: "I reply, on the authority of the Union, that no such domination exists, for the simple reason that the Union is not in a position to exercise it if it would. No Union makes such an admission willingly or boastingly; and that is presumptive evidence in favour of the statement." If true, such good news needs no comment.

This gives me one more opportunity for urging gas companies to adopt methods and means of identifying the interests of employers and employed. In some cases where they may have been deterred by fear of the Union, the above statement, and far more emphatically the recent experience of the Commercial Company, show that such fear is groundless. There is not the slightest risk of any difficulty in the way of any gas company making overtures for giving their employees a direct interest, beyond their salaries and wages, in the working of the business. I think the system in force at the South Metropolitan, the Crystal Palace District, the Newport, the Chester, and the Commercial Gas Companies will be hard to beat; but that some means of creating a real community of interest is absolutely necessary for industrial peace and good working, there is no doubt whatever. Companies have in this matter a great advantage over corporations; but it is only fair to say that at the Stafford Corporation Gas-Works a modified profit-sharing system was introduced by Mr. Bell, their late Engineer. The South Metropolitan plan has now been working twelve years, and never, during the whole time, has the labour question caused the slightest difficulty or given a moment's anxiety to any of us. It has, moreover, benefited greatly both parties to the arrangement. Mr. Shoubridge would say precisely the same after seven years' working of the system at Sydenham; but he would also join me in saying that any man who imagined it only needs a start, and that then it will work itself, would soon find he had made a mistake. Let no one enter upon this work unless he takes a real interest in it, and is prepared to work it with earnestness and intelligence; nor let him expect great results too soon.

My advocacy is not to be compared with the fox in the fable who had lost his tail. My feeling is rather such as I can imagine would have been that of the other fox had he succeeded in getting at the grapes and found them very good. They are so good and so plentiful, that the few who are enjoying them heartily invite all other foxes, big and little, to come and partake of the feast.

GEORGE LIVESEY.

Jan. 4, 1902.

* It will be seen, by what appears under the heading of "Miscellaneous News" (p. 38), that the statements referred to had not escaped attention. We may add that the extracts there given were in type before our correspondent's letter arrived.—ED. J.G.L.

Does the Electric Light Damage Drapers' Goods?

SIR,—When shopping to-day, my wife noticed that a lady objected to a fur for the neck because it had rusty-looking spots upon it. The shop assistant explained that it had been hanging near an electric light He said it was none the worse for wear, but he would reduce the price from 42s. to 35s. One of the largest furnishing and drapery establishments in the city in which I reside, in building new premises, has discarded the electric light entirely. In the old premises, from which they had to move in consequence of improvements, they turned out the gas in all departments. In the new ones, however, incandescent gaslight reigns supreme. My experience is that five years are ample to wear out the electric light welcome in any large place, and only the expense

stands in the way of the old favourite with its mantle development. But I have never till now heard of the electric light damaging stock.

Jan. 2, 1902. DRAUGHTSMAN.

Penny-in-the-Slot Meters.

SIR,—It appears to me it would be an advantage if slot-meters could have a contrivance added to them to register the number of coins put into them.

At every collection, I experience difficulty (to which no doubt the experience of other managers corresponds) with a small percentage of consumers whose money is short of the amount required to balance the gas registered against them. The consumer avers he has not been getting gas without pennies; that he has paid for all the gas he has burnt. On the other hand, the collector says the proper amount of money was not in the till. So a dispute arises between the consumer and the collector, which possibly causes much friction and ill-feeling.

It must be admitted that one of the weak points in the penny-slot system is an efficient check on the collectors. When the money is short, it causes suspicion (which may be groundless) to be thrown upon them. A register of the actual number of coins placed in the meter would—if it worked accurately—obviate this trouble, and provide a check which should be satisfactory to consumers, gas suppliers, and collectors.

I throw out the suggestion for the consideration of makers of slot-meters.

Jan. 3, 1902. H. T.

LEGAL INTELLIGENCE.

Embezzlement by a Gas Company's Secretary.

In the "JOURNAL" for the 17th ult., we briefly reported the hearing of a case in which William Hutchinson was charged with embezzling the moneys of the Bellingham Gas Company, of which he was at one time Secretary. He was then committed for trial at the Northumberland Quarter Sessions. The case was before the Court last Thursday, when defendant pleaded "guilty." Mr. Mitchell Innes pointed out the "extenuating" circumstances of the case. The money taken, he said, had not gone in drink and dissipation; it had been used in stocking his client's shop. Defendant had been Parish Clerk, had been Organist at the Parish Church, and had hitherto borne an unblemished character. Mr. Meynell, for the Company, stated that the total deficiency was about £100. He was instructed not to press the charge in any way. The Chairman (Mr. W. Askew Robertson), in sending the prisoner to gaol for twelve months, referred to the trouble the accused had given his employers by defacing and destroying different entries in his books.

Robbery at the Nine Elms Gas-Works.

At the South-Western Police Court last Tuesday, a man named Tom Lawrence, employed at the Nine Elms station of the Gaslight and Coke Company, was charged with stealing a pair of trousers, two shirts, a jersey, and 14s., belonging to a gas stoker. Mr. R. H. Humphreys, who prosecuted on behalf of the Company, said the men were in the habit of leaving their ordinary clothes in lockers in the lobby; and their confidence in each other was such that they invariably left the lockers unlocked. The prisoner had, not only in this case, but in others, taken advantage of their trustfulness to rob them; and both at the Nine Elms works and at other depôts of the Company where he had worked, similar petty thefts had been perpetrated. Prisoner was sentenced to two months' hard labour.

Belper Water Supply.—The handsome gift of Mr. Herbert Strutt, the Chairman, to the Belper Urban District Council, has been made absolute by letter. The whole of the loans on the public water supply are to be paid off. There are no reservations in the conditions, except that the Belper Water-Works shall be known for ever as the "Strutt Water Supply." The last beneficence reaches between £9000 and £10,000; and this has completed the cost of the works, computed to be worth £50,000 or £60,000.

A Dellwik Water-Gas Plant for Tipton.—At the last meeting of the Tipton District Council, the Gas Committee recommended the putting down of a Dellwik water-gas plant at the gas-works, and that the price of gas be increased 3d. per 1000 cubic feet from March 31 next. The cost of the water-gas plant and connections is estimated at £2530, and the buildings and foundations at £650—making a total of £3180. Threepence per 1000 cubic feet will bring in a revenue of £1125; so that the total cost of the plant would in this way be paid for in about 2½ years. The recommendations were agreed to.

New Issues of Capital.—In the six months ending Dec. 31, 1901, the following new issues of capital took place: Gandy Belt Manufacturing Company, £75,000 ordinary, £75,000 preference; Kitson Lighting Company, £185,000 ordinary; North Pembrokeshire Water and Gas Company, £30,000 ordinary; Petersfield and Selsey Gas Company, £16,000 ordinary, £14,000 preference; Power Gas Corporation, £250,000 ordinary, £100,000 deferred; and South Staffordshire Mond Gas (Power and Heating) Company, £450,000 ordinary, £35,000 "B." The total amount of new capital issued in the ordinary way in the past six months, according to the table in "The Times," from which the foregoing particulars are taken, was £37,804,878. Among the principal issues offered by tender were the following: Derwent Valley Water Board Board, £100,000; Gaslight and Coke Company 3 per cent. consolidated debenture stock, £130,550; New River Company, 3 per cent. debenture stock "D," £200,000. The total amount put up for tender was £3,630,550.

MISCELLANEOUS NEWS.

THE REPLY OF THE WELSBACH DIRECTORS.

The Directors of the Welsbach Company have issued their reply to the report of the Advisory Committee, which appeared in the "JOURNAL" for the 24th ult., and was commented upon in last week's number. Accompanying the reply is a personal address to the shareholders by Sir Henry Burdett.

The Directors' Statement.

Ladies and Gentlemen,—The report of the Advisory Committee, which is dated the 19th of December, 1901, and was posted by them to the shareholders on the 20th of December, was delivered, with a letter from the Hon. Philip Stanhope, by hand at the Chairman's private residence late on the evening of Friday, the 20th of December—Christmas week consequently intervening before it could be formally submitted to the Board and considered. It is to be regretted that the Committee did not submit their report to the Board before posting it to the shareholders, so that the Directors' reply might be circulated among them at the same time. The Board will not follow the Committee through the first forty-nine paragraphs of the report. Much of it is debatable matter; much of it is wrong; and much of it is introduced for mere prejudice. The matter contained in these paragraphs will be dealt with at the extraordinary meeting of the shareholders, which the Board have called for Wednesday, the 15th of January, 1902, at the Cannon Street Hotel, at noon The salient features of the report are paragraphs 50 and 51, containing a summary of findings and recommendations, to which the Board now reply in detail.

OVER-CAPITALIZATION.

It was public knowledge when the prospectus was issued that the Welsbach Company consisted of an amalgamation of several Incandescent Lighting Companies, and that its share capital was based on the assumed then market values of the concerns taken over. Of the original capital of the Company, the deferred shares, representing £603,500, were not issued to the public at all; of the preference, only £1,137,175; and of the ordinary shares, £987,175 were offered to the public—making altogether £2,124,350 of capital; and £142,500 was required to pay a dividend at the rate of 5 per cent. per annum upon the whole of the preference and ordinary capital. The net trading profits, as certified by the Auditors, Messrs. Deloitte, Dever, Griffiths, and Co., amounted to £209,808, leaving an ample margin, while the certified figures contained in the prospectus showed that the Company's was a growing business with apparently excellent prospects of increased dividends. It could not be within the purview of the Directors, and especially of the Chairman, to whom the business was entirely new, that competition would prove so serious as to cause the fall in prices that occurred, to which fact, coupled with the continuous attacks of the promoters from the autumn of 1898 onwards, the present trouble is mainly attributable. Again the preference and ordinary shares offered to the public were not taken up very largely by the public, but were subscribed mainly by two classes: (1) The shareholders in one or other of the Amalgamated Companies, who knew all about the business; and (2) the friends of the brokers and promoters who did the underwriting, and who had the fullest knowledge, having been responsible for the whole scheme of amalgamation, including the incorporation of the new Company. Next the Advisory Committee state that "the vendors and the first Board of Directors of the Company are largely responsible for the exaggerated estimate of the assets acquired by the Company." The Board desire to point out that, so far from these being an exaggerated estimate of assets, no estimate of assets was ever made or referred to in the prospectus. It is easy to be wise after the event; but the value as an investment of a rapidly growing business must always be a matter of opinion. The Directors note that the Committee are unable to produce any statement from the prospectus which is not borne out by the facts.

THE PATENTS.

The Directors hardly think that the Committee have given to the Board's legal policy that intelligent consideration which so important a subject requires. It must be obvious to the shareholders that the value of the Company's capital has largely depended upon the maintenance of its monopoly. To spend less than ½ per cent. per annum on the legal charges to maintain that capital has been in itself good business, as yielding four results: (1) The maintenance during the litigation of the Company's patents; (2) the suppression of the majority of the attempted infringers; (3) the discouragement of new infringers; and (4) it has afforded in itself necessary confidence and protection to the Company's agents and trade supporters. The policy of the Board for the future, as given in evidence to the Committee by the Chairman, is, so soon as the 1893 patent action is tried, and so far as a vigorous commercial policy will permit, to reduce as speedily as possible the present costly litigation.

COMMERCIAL POLICY.

It is to be regretted that no member of the Committee has had any experience of a practical nature in gas enterprise, and especially in incandescent lighting; for otherwise they would have known that experience has shown that the attitude of most gas companies to all forms of gas economizers has been one of either active or passive hostility. The Directors cannot too strongly deprecate the suggestion that the Company should place its interests mainly, as they understand the Committee's recommendation, in the hands of the gas companies, who would neither push sales nor recommend mantles, except to increase the consumption and sale of gas in competition with the electric light, and then only on their own terms. The goodwill of the Welsbach business depends upon the goodwill and active co-operation of the gas trade, as distinct from the gas companies. The trade so recently as the 1st of October, 1901, addressed a strong remonstrance to the Board, because of their present policy of giving special terms to the gas

companies; demanding an alteration in the policy pursued. If shareholders desire to ruin their business, they will alienate the trade by associating the Company mainly with the gas companies. The Board have always maintained, and agree with the Committee, that the policy of the reduction in price is the right one. It has, indeed, been followed by the Welsbach Board from June, 1898; and the time may arrive when it can be carried still further. They also consider that the cost of distribution should be materially reduced.

Management.

In speaking of the management, the Committee do but repeat, without acknowledgment, what the Chairman pointed out to the shareholders at the last general meeting, as the policy of the present Board, as the minute books record, and as the Chairman in his evidence to the Committee and in his interview with its Chairman showed—namely, that the present management must undoubtedly remain inefficient until the appointment of a General Manager. In this finding, and also in regard to their recommendation that a new Manager of wide experience and administrative capacity should be appointed, and the whole staff reorganized, the Committee have adopted, without reservation, the recommendation of the Chairman, as approved on the 6th of November, 1901, by the Board, and handed in to the Committee by Mr. Head. Mr. Head and the Chairman went even further, and gave the name of the gentleman who is probably the best man for the post of General Manager, owing to his intimate knowledge of, and acquaintance with, the incandescent lighting business. The Committee have apparently forgotten two important points: (1) That owing to the appointment of the Advisory Committee, the management they censure is of necessity practically in the condition it was left in just before the general meeting in June, 1901, by Mr. H. L. Peters, who had absolute control of it as Managing Director from the 1st of January, 1900, to the 13th of June, 1901. Mr. Peters explained to the shareholders that "this period was insufficient to make large changes in the system of distribution without the risk of affecting its efficiency at a critical time of the Company's business." (2) That the withdrawal from the direction of the promoters' nominees, which was completed in June, 1901, has left the present Board (none of whom were Directors of some or one of the old Companies), for the first time in the Company's history, free from the dissension caused by the promotor's influence, and united and agreed on the general lines of policy now endorsed by the Committee.

The Company's Interests in Other Enterprises.

The Committee charge that the funds of the Company were wastefully applied in the purchase of the Kern burner patents, and add that, although it was stated by the Chairman that "the Company was under obligation to complete this purchase at the date of its incorporation," they have no satisfactory documentary proofs in support of it. It is, nevertheless, the fact, which is all that the Chairman pointed out for the information of the Committee, that such a contract was in process of negotiation, as is disclosed in the seventh paragraph of the prospectus, and recorded in the minutes of the old Company. Nothing could better illustrate the danger of entrusting a business of a technical character like that of the Welsbach Company to gentlemen having no experience or knowlege of incandescent matters, than the recommendation of the Advisory Committee that the Kern burner interest of the Company should be realized. The Kern burner patents have already provided the shareholders with a new burner, a new mantle, and a new heater; and from these the Board anticipate new and valuable sources of revenue in this country and on the Continent.

The facts relating to the anti-vibrator patent are set out in the Directors' report of March 31, 1899. The Committee say that the payment of £10,000 is described as "commutation;" but they have neglected to point out that in the accounts at March 31, 1900, such part of the payment as had not been written off is described as "prepayment of royalties." The anti-vibrator patent has rendered good service by making it possible to successfully utilize the Kern burner for street lighting in the most crowded thoroughfares of large cities, and is thus materially assisting to increase the revenue from this source.

The Committee state that the interests of the Welsbach Company in other enterprises do not represent adequate value. These enterprises are kept separate; but to realize them would be a mistaken policy, as the Directors regard the Clamond heater and Kern Companies as valuable properties, which at infinite pains they have been developing with the view to their becoming important sources of revenue in the near future.

Administrative and Selling Expenses.

The Directors would remind the shareholders, in regard to the working expenses, that a gas-lighting company like the Welsbach Company has necessarily a season's trade; in other words, it has to meet its fixed charges for the entire year out of about seven months' active trading. The Board fear that much evil may result from the Advisory Committee's report being issued during the best season of the year, and the effects on the business may, in consequence, prove very serious for a time.

Having thus dealt with the evidence and recommendations of the Committee, and justified the policy of the Board in the past—which, whatever its faults, has led to a large increase in the business of the Company—the Directors confidently leave it to the shareholders to say that they are capable of conducting the affairs of the Company with success. This point is emphasized by the figures given in paragraph 19 of the Advisory Committee's report, where it is shown that the approximate number of burners and mantles sold since March 31, 1893, has been as follows:—

	Number of Burners Complete with Mantles.		Number of Renewal Mantles.
Year to March 31, 1894	104,278	..	178,246
,, ,, 1895	280,480	..	729,564
,, ,, 1896	593,467	..	1,637,821
,, ,, 1897	929,178	..	3,096,627
,, ,, 1898	552,224	..	4,016,273
	Burners.		Mantles.
,, ,, 1899	602,159	..	4,511,536
,, ,, 1900	549,677	..	5,027,055
,, ,, 1901	962,299	..	8,163,563

The Board have further the pleasure to report that the audited statements of accounts of the business done for the half year ending Sept. 30, 1901, show that, whereas there was a loss of £6800 upon the English business for the corresponding period of six months during 1900, the Company made a profit during the same period of this year of £11,328; showing an improvement in the net trading profits for the six months of £18,128. The foregoing satisfactory results in the lean half of the year's business justify the conclusions arrived at by the Committee as to the prospects of future success of the Welsbach Company. The Board, however, are fully entitled to point out this success has been rendered possible of achievement by their past management.

Reduction of Capital.

On the suggested reduction of capital, the Board would be much indebted to the Committee and their legal advisers if, under the peculiar circumstances of the Welsbach Company, they can point out any feasible manner by which this proposal can be carried out. The Board have sought the best legal opinion open to them, and are advised that such reduction is, under present conditions, impracticable without a Special Act of Parliament, which would in all probability be refused. The Directors submit that it is chil ish to suggest that the deferred shareholders will voluntarily cancel their shares for the benefit of the holders of other classes in the Company. It is equally futile to suppose that the preference stockholders will be disposed to forego any part of their capital and dividend to benefit the ordinary stockholders and deferred shareholders. It is further evident to the Board, who are most familiar with the present condition and future prospects of the Company, that until it becomes possible to estimate, from accurate and incontrovertible evidence, what the minimum earning power of the Company is, the reduction in capital will not benefit any class of the present shareholders, but quite the contrary.

The Advisory Committee.

The Advisory Committee were appointed, and the names of the four business members composing it accepted, at the urgent suggestion and request put forward by Mr. Walpole Greenwell, to advise the Board as to the future policy and management of the enterprise; and the Board welcomed the suggestion of their assistance. The remaining two members—the Hon. Philip Stanhope and General Russell—were the gentlemen who moved for a Committee at the general meeting in 1900. The Board had no representative upon this Committee, and, so far from advising, the Committee have only hampered the Board's work, and—perhaps unavoidably, but none the less certainly—have injured the interests of the shareholders, owing to the length of time necessarily occupied by their proceedings, and the consequent delay in the appointment of a General Manager to control the business. The net result of the Committee's report is that, where it is constructive, the previous recommendations and policy of the Board are adopted in every instance, and no new practical suggestion is made, except the reduction of capital, and the recommendation that there should be a closer association of the Company with the large gas companies, which recommendation betrays a want of knowledge of the business, and would, if acted upon, be disastrous. Where the report is destructive and casts blame, it is either in direct contradiction to the statments made at the meeting by shareholders who subsequently became members of the Committee, or is based upon an incorrect statement of the facts. In particular, the Committee report: (1) That the Chairman is especially responsible for the over-capitalization, whereas it is proved to demonstration, from his separate circular, that the scheme and capitalization were unalterably settled before he even had anything to do with the Company; (2) that, in view of past dissensions and errors, the present Board are incapable of conducting the affairs of the Company with success, whereas it was conclusively shown at the last (June) meeting that such dissensions ceased on the withdrawal which was then announced of the promoters' nominees on the Board, and its reduction to five members, who were then working harmoniously, and were agreed as to the policy, now endorsed by the Committee, upon which the business would be conducted free from those errors. (3) The Committee draw attention to the practice which prevailed of distributing bonuses amongst employees, whereas this practice of the old Company was not continued by this Company; in fact, the Auditors, Messrs. Deloitte, Dever, Griffiths, and Co., certify that "no bonuses have been dealt with by the Board of the Welsbach Company in the manner suggested by the Advisory Committee in paragraph 37 of their report." (4) Opposite a margin note, "Accounts badly kept," the Committee find that until June, 1900, the accounts were kept in "an involved and unsatisfactory fashion;" whereas the Auditors of the Company, referring to the whole period of the Company's trading, certify that "the books are kept in a clear fashion, the entries are neatly and correctly made, and anyone skilled in accounts should not have the least difficulty in understanding them." (5) The Committee find that there was no reasonable ground to justify the purchase of the Sunlight Company, and that there was nothing to show for the large consideration paid; whereas, apart from other advantages gained, the Company were subjected to serious competition, which has thus, in a great measure, been removed. In particular, the Company acquired certain patents, which may in future prove of great advantage to the Company when their present patents expire.

Policy of the Board.

The policy foreshadowed at the last (June) meeting, which is now largely adopted without acknowledgment by the Committee, consists of proposals:

1.—That the duties of the Board should be chiefly of a consultative character, and directed to a supervision of the general policy of the Company.
2.—That the direct administration of the business should be in the hands of a new General Manager of wide experience and administrative capacity, whose first duty it will be to reorganize the staff and reduce the expenses.
3.—That the policy of reduction in prices is the right one, and the time may arrive when it can be carried still further.
4.—That the policy of fostering new sources of revenue be maintained.

5.—That the position of the Company should be upheld, and extended by a vigorous commercial policy, without the aid of unnecessary litiga ion.

6.—That although the reduc ion of capital at the present time is impracticable, the consideration of this question shall not be lost sight of.

This policy was advocated in its entirety, and laid down as the policy of the present Board by the Chairman and Mr. Head at the last general meeting of the shareholders, as the report of the proceedings on that occasion proves to demonstration. The shareholders will therefore see that the only sound policy is the policy of the present Board; and so far as the Advisory Committee's recommendations are sound, they embrace precisely this policy and no other. It is for the shareholders to say who shall be entrusted with the duty of carrying that policy out. On the one hand, they have the Advisory Committee or their nominees, who must be experienced men so far as the incandescent business is concerned; and, on the other, they have a united Board of Directors, who have the most intimate acquaintance with all the ramifications of the business, but who have never yet been free to put their policy fully into force, or to manage the business independently on its merits in accordance therewith.

The Directors confidently appeal for support to the large majority of shareholders who stood by them at the general meeting in June. Nothing has happened since to justify any lessening of the shareholders' confidence in the present Board. On the contrary, the cost of distribution has been reduced, despite the hampering presence of the Advisory Committee, and the business has been further extended and increased. Had there been no Advisory Committee, not only would the policy which that Committee have so largely appropriated and now recommend for adoption have been pursued by the Board, but all necessary modifications in the existing system would have been made; and the business would by this time have been placed under the efficient direction of a General Manager of experience and knowledge, so that the Company would have been well on its way to emerge from its present difficulties.

Since the issue of the Advisory Committee's report, the Directors have to deplore the death of their colleague, Colonel Ellis. who died on Dec. 27, 1901.

(Signed) HENRY C. BURDETT, Chairman.
JAMES HEAD. L. DE FONBLANQUE. FREDK. CLARKE.

Sir Henry Burdett's Statement.

Ladies and Gentlemen,—There is one statement in the report of the Advisory Committee affecting me personally, as apart from the Board, which I cannot pass unchallenged.

It will be found in paragraph 13, and is as follows: "Although no legal redress would appear to be possible, the real responsibility for the excessive over-capitalization of the Company must be shared, in great measure, by the original Board of the Welsbach Company, and more especially by the Chairman, who occupied a position of financial repute, and was naturally regarded as a sponsor for the value of the properties which the Company acquired." That paragraph imputes that the purchase price to be paid by this Company on its formation was fixed by the original Board of this Company, and more particularly by myself, and that I am more especially responsible for an excessive over-capitalization of the Company. That statement is the keystone of the arch upon which the report of the Committee rests for the justification of its attack.

The fact, however, is that I took no part either in the fixing of the capitalization, the purchase price of the properties involved, or in the promotion; and that so far, to quote the Advisory Committee's words, from "the responsibility for the excessive over-capitalization being shared in great measure by the original Board of the Welsbach Company, and more especially by the Chairman," I (*i.e.*, the Chairman) had nothing whatever to do with these matters. Before I was in any way approached, the price paid by this Company on its formation, its capitalization, and the values of the properties were all fixed and agreed to, after prolonged inquiry and negotiations in London and Vienna between the promoters and the members of the Board of the Incandescent Gas-Light Company, Limited (the old Company); the latter of whom became the Directors of this Company at its formation.

The circumstances under which I was invited, and ultimately became the Chairman of the Company, are as follows: Prior to the middle of November, 1897, I had no knowledge of, or interest of any kind in, the Incandescent Gas-Light Company, or any of its kindred enterprises. About the middle of that month, I was approached by Mr. Weguelin, of Messrs. Linton, Clarke, and Co., who urged me to become Chairman. This was the first I heard of the proposed Welsbach Company. The scheme for the reconstruction of the existing Incandescent Gas Companies and the incorporation of this Company, had then been definitely formulated; nineteen agreements embodying the details of the scheme had been entered into and signed, including the agreement of the 10th of November, 1897, between the Incandescent Gas-Light Company (the old Company) and the Reconstruction Guarantee Company, Limited (the promoters), under which this Company was to be formed with a registered capital of £3,500,000, divided into the same amounts and classes of shares as at present. The old Company had sent out a circular dated Nov. 10, 1897, to each of the shareholders in that Company, and the English, Austrian, second Austrian and Irish Incandescent Companies, stating the capitalization, and "that the Directors [that is, of the old Company] had very carefully considered the scheme in all its bearings, and were convinced that it was one which it would be in the best interests of the shareholders of all the Companies to accept." The agreement of re-sale from the promotors to this Company had been prepared, and an extraordinary general meeting of the shareholders of the five old Companies, to approve of the scheme and re-sale agreement, had been called for the 19th of November, 1897. I first had knowledge of these matters when Mr. Weguelin approached me, and sent me two of the circulars convening the meeting.

In answer to some criticisms which I made as to the capital of the Company, I was told that it was unalterably fixed. Mr. W. Capel Slaughter, who was in 1897 acting as my Solicitor, to advise me in this matter wrote me, under date 2nd July, 1901, that his "criticisms with regard not only to the enormous capital, but also as to the way in which it was sub-divided," were met at once by the promoters with the reply, "That is all settled, and cannot be altered." Mr. J. G. Craggs, of Messrs. Craggs, Turketine, and Co., chartered accountants, at my request, inquired into, and reported to me fully, the position of the business of the Welsbach Company at the time, and the relation which the net earnings and the growth of that Company's business bore to the capitalization. Mr. Craggs' report, which is open to the inspection of any shareholder, satisfied me on these points. This brief recital of the documentary evidence proves, in my judgment, that in this matter I have received less than justice at the hands of the Advisory Committee.

While my investigations into the business of the Company were proceeding, Mr. Walpole Greenwell, of Messrs. W. Greenwell and Co., whom I have good reason to consider an authority upon industrial undertakings, called on me, stated he had been pressed to join the Reconstruction Guarantee Company, Limited, and to underwrite £500,000 of the Welsbach Company's capital, and asked what I was going to do in the matter of the chairmanship, which I had not then accepted. It was agreed between us that he should inquire into the scheme of the Company, while I proceeded with my inquiries into the business. In the result, Mr. Walpole Greenwell informed me that he was satisfied; and, thereupon, he became a member of the Reconstruction Guarantee Company, Limited, and participated in the underwriting to the extent mentioned. Thus both Mr. Craggs' investigations and those of Mr. Walpole Greenwell proved satisfactory. My Solicitor, Mr. W. Capel Slaughter, was also satisfied as to the patents and other matters within his province. These are the circumstances under which I consented to become Chairman of the Welsbach Incandescent Gas-Light Company, Limited. Had Mr. Walpole Greenwell not been satisfied at the time with the business, or with my selection and the conditions of independence which I made in the interest of the shareholders, I should not have become Chairman.

I have since ascertained that, while my appointment was under consideration by the Board of the old Company, and again when the Company was floated, the promoters stated that they would get rid of me later if I gave any trouble. Although I was ignorant of this, it soon became very evident to me that the promoters exercised too much control over the direction of the Company, and that in consequence my authority and independent position were being undermined. I therefore made it my business to leave no stone unturned whereby the shareholders' property could be freed from the influence, direct and indirect, and the control of the promoters in whatever form it might take; and it is to this fact that I attribute most of the hostility which has pursued me as Chairman almost from the outset to the present time. When the Board was, at the last general meeting, reduced to five, and the nominees of the promoters were eliminated, I imagined that a new era had dawned for the shareholders; so that when Mr. Walpole Greenwell suggested to me the appointment of the Advisory Committee and the names of the members to compose it, the majority of them clients of his or connected with his undertakings, I thought that I was serving your interests by agreeing. I leave you to judge of this by the result.

Through all the difficulties which have beset the Company, I have resolutely, and at great sacrifice, stuck to the ship. I have shown my confidence in its ultimate success by investing in its stocks and shares; and my holding at the present time is £35,000, or thereabouts. I have never sold any of my holding from first to last, except a small amount of preference stock (£1595 in April, 1898). I have endeavoured to place the issue clearly before you. I took my mandate solely in the interests of the general body of shareholders, and upon the shareholders I rely to support me in the present crisis in the Company's affairs.

(Signed) HENRY BURDETT,
Chairman, Welsbach Incandescent
Gas-Light Company, Limited.

76, York Street, Westminster, S.W., Jan. 2, 1902.

THE CRISIS IN BRITISH INDUSTRY.

Mr. George Livesey's Views.

In the "JOURNAL" for the 17th ult., reference was made in our editorial columns to the series of articles on the above subject which are appearing in "The Times." They have necessarily led to a good deal of correspondence in the columns of that paper; one of the latest writers being Mr. George Livesey. It was hardly to be expected that the Chairman of the South Metropolitan Gas Company, with all his experience of labour troubles, and as a member of the Labour Commission, would refrain from expressing his views on the question under discussion; and that he did in "The Times" of the 30th ult. We give his letter, as a valuable contribution on a subject of great national importance.

Sir,—I have read with great attention the whole of your articles and the correspondence on "The Crisis in British Industry," to which there has really been no reply, for the simple reason that, unfortunately, the charges are too true. It cannot, however, be your intention that the matter should rest here; and with that assumption, I ask you to permit me to try to carry it a little further.

To treat bodily diseases successfully, it is very desirable to know their nature and their cause. The same may be said of diseases of the body politic, if we would find and apply a remedy. The nature of the evil has been most clearly and forcibly set forth in your columns; but, to rightly understand the position, the hidden motive that prompts the action of Trade Unionist workmen must be found. In former times, there always have been many individual workmen who did not care to work harder than they considered necessary; but the present complaint is that numbers of men have tacitly agreed to restrict their work in every possible way. This they do for a definite object, which, so far as the reduction of hours is concerned, was made quite clear by witness after witness at the Labour Commission. That object was the absorption of the unemployed. They said, if with an eight-hour day there should still be men unemployed, they would

reduce to six hours; and if that did not attain their object, four hours should be the working day. The restriction of work done per man or per machine is mainly for the same purpose. The idea is that, if there were no unemployed workmen, the employers would be helpless, and the "emancipation of labour," so constantly advocated by Trade Union speakers at congresses and elsewhere and in their trade journals, whatever it may mean, would become an accomplished fact.

Their real object is simply mastery, which always was, and always will be, struggled and fought for when bodies of men are divided into different camps. Nearly all the great strikes of recent years have been waged for this object. As an illustration, take that of the Penrhyn Quarry, where a brave man and his able Manager have carried on for over a year a single-handed contest to determine whether the owner or the Trade Union shall control the working of the quarry. Lord Penrhyn, however, is fighting more than his own battle—viz., that of employers generally, and still more that of freedom for working men, who, if they knew it, would hail him as one of their best friends. Happily he is winning, and is thus doing well his part in this crisis in British industry.

If it is necessary that the great industrial army should be divided into two camps, one must be master; but let the fight be conducted on fair lines. How is it that the British love of fair play that we are proud to think characterizes all classes of our people—the working men equally at least with all others—should be disregarded by large numbers of them, who, as is proved by your articles are certainly not fighting fairly in this matter? I reply: It is not all the fault of the men. They have for many generations been accustomed to act under orders; consequently leaders are at present an absolute necessity. Their natural leaders are their employers, who might, and ought to, have led, but have neglected that important duty, with the inevitable result that working men have been—I do not say intentionally—misled by the men who, with a few honourable exceptions, control the Trade Unions.

Far be it from me to speak in disparagement of British or Irish workmen. With the remembrance of many acts of kindness and assistance in my business relations with them for over fifty years, I also know something of their weaknesses and failings; but it may be asked whether other and more favoured classes would have done better under the same conditions. I also know something of their many fine qualities—witness their courage, patient endurance, and kindness of heart in South Africa, while their comrades at home are in many cases nobly doing their part in providing for the wives and families of the Reservists. Note also their loyalty to their leaders and to one another—an example to many employers; their readiness to go anywhere and do anything, however unpleasant, difficult, or dangerous, when suitably directed or led. Parenthetically, let me say that the workmen whom I knew fifty years ago, many of whom learnt their trades at the beginning of the century, were at least the equals of present-day workmen in skill and capacity for work and in character. How is it that men with such fine qualities can act as your Special Correspondent proves that they do in so many trades? The answer is: Socialist teaching, wrong leading, and the inherent inability of the simple wage-hire system of remuneration to give them a vital interest in their work.

The wage-hire system, as a transitional step from slavery and serfdom to the ultimate goal of partnership in some form, was doubtless the only practicable method. When businesses were small, and masters and men worked together, there was very much in its favour, and the results were satisfactory. But the entire change of circumstances—the development of the factory system, the growth of enormous businesses, and the influence of the Trade Unions—has divorced employers and employees (they must no longer be called masters and men), and produced the present extremely unsatisfactory position. The old ties between the parties are broken, the only connection in the building trades, for instance, is an hour's time, an hour's pay, an hour's notice, and these who should be friends, and in some real sense partners, are in constant antagonism. So far as I could understand Mr. Ashbee, I disagreed with him; but there is a sentence that he puts into the mouth of a workman which is perfectly true. He tells us the workman says, "My employer's business is his business and not mine." This is the sole and simple reason why the workman takes no interest in it; and this is the position to which the simple wage-hire system has brought British industry. It is the old story; the circumstances have changed, we have adhered to our old methods, and only on the pressure of very urgent necessity shall we think of altering or modifying them.

We cannot go on as we are. You, Sir, have materially helped to make that impossible; but in what direction must the remedy be sought? Mr. Bramwell Booth appealed to certain Trade Union leaders to use their influence with their members to work better; but that is useless. Where they have tried to do so, they have failed—witness the constant appeals of the officials of the Boilermakers' Union. It is simply impossible that industrial salvation can come through the Trade Unions. "Trade Unionism is war with employers; co-operative industry is concert with capital." So Mr. George Jacob Holyoake, who knows Trade Unionism as well as most men, told the Labour Commission. He has repeated the statement in the last November number of the monthly journal "Labour Co-partnership;" and Mr. Holyoake is right.

We want workmen to act in "concert with capital"—"community of interest" was the term recently used by your correspondent—and this can only be obtained by giving them some direct and tangible interest in the business of their employers; making it, in fact, to a certain extent, their business as well as his. Mere wages cannot do it; but they must at present, and probably always will, form the basis for the payment of labour. They can, however, be supplemented (recently illustrated by Sir E. Fry's Grimsby fishery award) by a share of profits. The French call it *participation;* we use the term "profit-sharing" or "co-partnership." The system necessarily varies with the different businesses; but, so far, this is the only principle—that of community of interest—that can unite the parties and induce them to work cordially together. It is not a new idea, having been publicly advocated in 1868 by the late Professor Stanley Jevons, who said, in a lecture on "Industrial Partnerships," that "great good would arise" from the arrangement "of giving to workmen in part the position and direct interest of employers; by allowing them to invest some of their savings in the capital of the business in which they are engaged, and by paying part of their wages by a share of the profits." That suggestion has been carried out in practice; and the prophecy of Professor Jevons "that great good would arise" has already been abundantly fulfilled.

How is the remedy to be introduced? It must be by the employers, for they only can apply it. The initiative absolutely rests with them, and, although the Trade Unions do not like it, and will oppose it strongly, a resolute effort by employers will generally prevail. About four months ago, a London Gas Company offered to their workmen a similar profit-sharing system to that adopted in 1889 by the South Metropolitan Company. The Gas-Workers' Union have a strong following in the Company in question, and held meetings and passed resolutions that their members were not to accept the scheme. But practically the whole of the men signed the contracts of service which were the condition of acceptance. The bonus payable next June, based on the price of gas, will be at the rate of 4 per cent. on salaries and wages, payable half in cash and half in the Company's ordinary stock at the market price. The Managers say there was an immediate change for the better in the bearing of the men; and there is every reason to expect that their relations with their workmen will be as thoroughly satisfactory as they are at other places where the system is in operation, to the great and lasting benefit of employers and employed.

It may be remembered that in one of the articles in "The Times" the writer dealt with the conditions of labour at the South Metropolitan Gas-Works. In the course of his remarks, he stated that the business was now conducted "much more cheaply there than at other London gas-works which are still under Trade Union domination." He further stated that the wages amounted to 3s. 7d. per ton of coal used in the case of the London Companies who have not thrown off the Trade Union yoke, as against 2s. 2d. at the South Metropolitan works. These statements were disputed by a correspondent—Mr. G. J. Wardle—who wrote: "I have made inquiries at the Gas-Workers and General Labourers' Union offices, and I am informed that in no London Gas Company are the Union men a determining factor. Neither at Beckton, King's Cross, nor Fulham has the Union got sufficient members to interfere with the policy of the management if it wished to do so; and, as a matter of fact, they have never attempted to enforce the 'go easy' policy anywhere, or countenanced it in any way. According to a prominent official of the Union, the difference in the cost of production (supposing it to exist, which is by no means proved on the bare assertion of your correspondent) is caused chiefly by the fact that the Gaslight and Coke Company has to carry its gas longer distances, and the South Metropolitan, being more compact, has not to use so much exhaust power in pumping gas. The remainder of the difference, if any, may be accounted for by the difference in methods employed. In no two gas companies are these methods identical. In some works stokers have only to draw the retorts, while in others they have not only to draw and charge, but also to carry out the coke as well. The greater specialization, the introduction of machinery, and the natural advantages enjoyed by the South Metropolitan are the chief, if not the only, factors which account for the cheaper production; though it is quite possible the greater 'drive' of profit-sharing may have something to do with it as well. But it is simply not true to say that Trade Unionism has anything to do with the problem, as, for all practical purposes, it is non-existent in the other London gas-works, where it is said to be such an important factor in controlling the output."

To this letter Mr. Livesey promptly replied as follows: "The statement in question referred to carbonizing wages only—that is, the total labour cost of putting coal into, and removing coke from, the retorts, exclusive of all other labour charges, such as purifying, all yard labour, distribution, &c. The accounts of the London Gas Companies are strictly comparable, because they are kept in accordance with the form prescribed by the Board of Trade Auditor; but as 'comparisons are odious,' although quite true as stated by your Correspondent, I shall make none between this Company and its friends and neighbours beyond saying that the wages—exclusive of profit-sharing—it pays to its stokers are at least equal to those paid by the other Companies. I will compare the South Metropolitan under Trade Union rule with itself when free from the Union. Prior to the advent of the Union in 1889, it cost the Company 2s. 7d. per ton of coal for carbonizing wages. The Union came, and the cost went up to 3s. 7d. per ton. We freed ourselves from the Union, or rather the whole of the Unionists left us of their own accord, and carbonizing costs at once dropped materially, and have now reached the figure of 2s. 2d. per ton of coal, though the rate of wages was increased in 1898 by 7½ per cent. This is due to three causes: (1) The extensive use of machinery; (2) the willingness of the men to work that machinery for all it is worth, so much so, in fact, that our Managers have been told not to let them try to do more; (3) the general good working of the hand stokers and of the men all round. Exactly the same has happened at the Crystal Palace District Gas Company, where a similar profit-sharing shareholding system has been in operation since 1894. The other London Gas Companies will be grateful to Mr. Wardle for the information that 'Trade Unionism . . . for all practical purposes is non-existent in the other London gas-works,' for the visits of the Trade Union officials to the managers to regulate the work may now be expected to cease."

To this Mr. Wardle rejoined as follows: "Mr. Livesey's conception of the laws of evidence must be very curious. Your Correspondent [the writer of the articles] makes certain assertions as to the cost of labour at certain gas-works in London, and asserts that this is due to the domination of the Trade Union. I reply, on the authority of the Union, that no such domination exists—for the simple reason that the Union is not in a position to exercise it if it would. No Union makes such an admission willingly or boastingly, and that is presumptive evidence in favour of the statement. The position stands thus: Your Correspondent asserts such tyranny exists—the Union denies the soft impeachment. Mr. Livesey points triumphantly to the increased cost of labour for performing certain operations as a proof. Now, this is

not evidence. Mere assertion on the one side or the other is not proof. . . . . Mr. Livesey states that when Union men were employed at the South Metropolitan Gas-Works, the cost of labour went up. Why it went up he does not say; but he does say why it went down. And, strangely enough, he gives the very reasons I gave in my first letter, with one exception. First and foremost, he puts the extensive use of machinery. Secondly, the willingness of the men to work that machinery for all it is worth (and here, it is curious to note, the zeal of the men is so great that the managers have had to institute the policy of 'Ca' canny' themselves). The third reason is the general good working of the men all round. In other words, the greater 'drive' from profit sharing. Mr. Livesey's own reasons so far agree with what I stated, and show that Trade Unionism is by no means either the only or the chief factor in decreased cost of production, looking at it from the point of view of the employer. Whether the employed find it all to their advantage is a question into which we will not enter."

EXTENSIONS AT THE TYLDESLEY GAS-WORKS.

At the Meeting of the Tyldesley-with-Shakerley District Council last month, reference was made to the completion of a portion of the extensions at the gas-works to be carried out in accordance with the recommendation of the Engineer (Mr. W. H. S. Gendall). During the discussion on the subject, Mr. Gendall was congratulated upon the way in which he had overcome the many difficulties that had presented themselves, and, for the first time for many years, had maintained a constant supply of gas during the winter. Our readers may possibly remember that troubles have for some years beset the Gas Committee; but, with the aid of their present Engineer, the works are rapidly assuming such a shape as to become a source of profit instead of loss. Almost from the time they were built, upwards of twenty years ago, subsidences have taken place through the mining operations going on all round the district; and it is unfortunate that the works were erected in such a substantial manner as to make the removal to a new site expensive. It has been no unusual occurrence for the water-level in the only gasholder tank to fall 2 feet in one night; and as the tank contains a telescopic gasholder 92 feet in diameter and 20 feet deep, the difficulty and danger of cupping under such conditions are obvious. To stop the various leaks, many remedies have been tried. When Mr. Gendall was appointed, he found that the inner lift would not work in the outer shell, for the latter was more than 12 inches out of the tank on one side, and below the coping at the opposite column, while the holder could not be cupped owing to the level of water in the tank. Under such conditions, it is easy to understand that the inner lift jammed occasionally, and made the supply irregular, even when there was a stock of gas. The retort, meter, and purifier houses were all more or less out of the perpendicular, and trussed and propped in various ways. The tar and liquor tanks were split across, the meter registration was out of order, retorts were all in need of repairs, and the centre-valve was at fault; while the mains supplying many districts were too small, and there was a generally increasing demand for gas. These were difficulties that the new Engineer had to encounter, while added to them was a failure of the water supply, owing to the drought, and a general strike at the works. The strike having been disposed of, the outer lift of the gasholder was suspended, the framing plumbed, and the inner lift made to work freely, although at the sacrifice of a further 2 feet of storage capacity; while an old sewer on the works boundary was opened up, and a pulsometer fixed so as to supply the gasholder tank when the other pump and the local supply failed.

After a careful examination of the works, Mr. Gendall made some drastic proposals, and the Committee adopted his recommendations. The first of them was to immediately construct a new gasholder in a steel tank upon a part of the works fortunately free from subsidence. It was too late to formally make application to the Local Government Board for the necessary powers; but a deputation went to London and interviewed the officials. They made such a successful appeal, that permission was granted and the contract let. A large part of the excavation necessary was through the red sandstone; yet such progress was made that before the heavy season commenced a telescopic spiral-guided gasholder, in a steel tank, was erected and set to work; and we understand the contract was carried out in record time. Steel shells have been fixed inside the tar and liquor tanks, enabling them to be still of service; additional retorts have been built; and a new roof has been constructed over the coal-store. Unfortunately, during November, the entire retort-stack showed signs of collapse. Some additional stays and tie-rods were immediately fixed, and they appear to have prevented further failure.

At the meeting of the Council above referred to, Mr. Tinker said the gas undertaking was not likely to be a "white elephant" much longer, for there was every probability of its being made a paying concern, and the consumers might expect cheaper gas before long. The Engineer and Contractors were to be congratulated upon the work so far carried out, which was of first-class order. Messrs. R. and J. Dempster, Limited, of Manchester, have erected the gasholder and steel tank—the former being constructed on their improved spiral-guided principle; and the same firm were Contractors for putting the original holder into working condition.

MANUFACTURES IN SCOTLAND LAST YEAR.

A correspondent sends the following notes on the above subject: "The manufacture of fire-bricks was in a most unhealthy condition during most of last year in the Glasgow district, as fuel and labour were at a high level; and the prices of the fire goods were at the lowest level known for many years. In addition to this, the demand for home consumption was both poor and irregular. Fairly good orders were booked here and there for shipment, but at very low prices. Except for several heavy shipments, some of the works would have had to restrict their make or close for a time. Not much better outlook for the trade in the New Year is showing itself. Roof-building, both of galvanized and of plain sheet-iron and steel, was fairly brisk during the past year. The outlook for 1902, however, is very uncertain, and not particularly rosy. Lead workers, both in sheets and pipes, were fairly well occupied; but the lead trade was seriously disorganized by the serious fall in prices in the course of last year. The fall was from £23 to £18 per ton in 1854; but 1901 opened with a fair demand for lead at £16 10s. per ton, and closed with a slow trade at £10 10s. per ton. Red-lead was at £14 per ton, and dry white at £17; white in oil being at £19 per ton. Boiler making, both in Glasgow and in towns throughout Lanarkshire and the adjoining counties, has been brisk—in some case exceedingly brisk. Pipefounders were very busy during a large part of last year, and the malleable iron and steel tube trade was never very brisk. Prices have fallen to a considerable extent from the high rates of the preceding year. But against this has to be put the fact that iron, steel, and coal have fallen considerably in price. In many respects, the prospects of the trade are encouraging. Tube making is an industry that seems almost to have centered in the Glasgow and Coatbridge districts; and it is one on which the gas-making industry is necessarily largely dependent."

MANCHESTER GAS AFFAIRS.

The Manchester Corporation Gas Committee have authorized the immediate establishment of an installation of intensified gas lighting on the three sides of the new Municipal School of Technology in Sackville Street, Whitworth Street, and Granby Row. There will be 27 lamps, aggregating 24,000-candle power; and it is contemplated that they will constitute one of the most brilliant displays of lighting by this particular method yet attempted in this country. The intensifying apparatus will be placed in the basement of the school.

During December, 10 tons of coppers were removed from the penny-in-the-slot meters throughout the district. The value of these was £4612; and this sum is about £400 more than has previously been earned by the prepaid meters in any one month. About 39,000 meters of this class are in the hands of customers of the department. Formerly the great harvest from the source referred to used to cause a glut of coppers; and there were suggestions that a specially large safe should be constructed to hold the money. Conditions have changed, however, and banks and private customers in the city are now ready purchasers of all the coppers that come to hand month by month.

It is stated that during the past nine months there has been an increased make of gas of more than 3·33 per cent., or 105 million cubic feet, as compared with the corresponding period of 1900. Practically the whole of this increase has taken place in the final quarter of 1901; for there was an advance of 102 million cubic feet in the three months ending Dec. 31, as compared with the quantity manufactured in the last quarter of 1900.

The Gas Committee have decided to adopt the suggestion of the City Justices with respect to the double test for meters. By this arrangement, the index and drum of each meter will be tested separately, and certified as correct before the meter is stamped and issued as a completed instrument. The Committee have resolved that early information with regard to this proposal be given to meter-makers doing business with the Corporation, and that the fee for the extra test be paid by the Committee. The new test will be applied as soon as the necessary arrangements are completed; and this will ensure that all meters are complete as standard measures.

LEEDS GAS WORKERS.

Conditions of Labour.

At the Meeting of the Leeds City Council on Wednesday last—the Lord Mayor (Mr. A. E. Butler) presiding—the question of the wages and conditions of labour of the gas workers was again brought up.

Alderman Lowden, in asking the Council to approve the proceedings of the Gas Committee, reminded the members that this subject had been before the Committee on various occasions for nine months past. Since the last meeting of the Council, another deputation from the men had waited on the Committee; and the members had been furnished with further details as to the working of the Committee's proposals. It had, however, been decided to adhere to the former resolution. The Committee's offer was not accepted by the men, who now wrote, through Mr. J. E. Smith, of the Gas Workers and General Labourers' Union, that it would mean in some cases their working only five shifts a week; and they therefore asked the Committee to withdraw the conditions. This was a somewhat different position from that taken up a few weeks ago, when they expressed themselves not averse to stop work for one day in seven, if that day was a Sunday. The arrangement would not give the Committee a single advantage, financial or otherwise; the only object they had in view was to find employment for more men. Over and over again they had been told there was anxiety on the part of leaders of Unions to provide work for as many men as possible; and he confessed he thought the offer would have been seized with avidity, and would have pleased the men. However, it appeared that they were not sincere in their professions when some sacrifice was entailed on their part. The men had accepted the concession of 4d. per shift, provided no conditions were attached as to Sunday labour. But here was a singular thing. When he first entered the Council, there was an agitation to do away with Sunday labour; and the Gas Committee incurred very large expenditure to increase the storage capacity with this idea. Then, in 1896, the men came before the Committee with the serious complaint that their wages had been reduced because there was no Sunday labour. More than that, they objected to the employment of yardmen to keep the retorts in proper condition over the Sunday. So that what was happening to-day was that the men were reverting to the original position of wanting to do away with Sunday labour. Again, at the New Wortley works, 246 men out of about 300 presented a memorial accepting the terms of the Committee; and then (he supposed as the result of influence brought to bear on

them) they had amended this by signifying that they would accept the Committee's terms if six shifts a week were guaranteed. But, as he explained, no guarantee could be given that there would always be six shifts. At present, the Committee could not do without Sunday work. There was only one way of getting rid of it, and that was by increasing not only the storage, but the output. The maximum gas storage at present was 13 or 14 million cubic feet; and the ordinary daily output, about 14 million cubic feet. But if a fog came on, as much as 17 million cubic feet would be required in a day; so that if the fog lasted for a week, the storage would be more than exhausted. Until the day came when the storage capacity and output could be increased, it was idle to talk about abolishing Sunday labour. The Committee had spent considerable time in hearing applications and making inquiries all over the country; and the conclusion they had come to was that the Leeds gas workers were as favourably situated as any others. By working according to present hours seven shifts, with time-and-a-half allowance for Sunday, a man would, with the advance, be able to earn 41s. 3d. per week. Supposing there were no Sunday shift, and only five shifts were worked, the lowest wage would be 27s. 6d.

Alderman WALKER seconded the m tion.

Mr. E. O. SIMPSON thought, subject to anything that might be said on the other side, the members of the Council ought to support the action of the Committee.

Mr. CONNELLAN moved, as an amendment, that the question be referred back to the Committee. He said there was not a single gas-works in the United Kingdom operating under the conditions which Alderman Lowden proposed to introduce into Leeds. These conditions meant that the men would be called upon in turns to take a day off during the week. They would not object in the least to take Sunday off—in fact, they did not want Sunday work; but they did object to taking their day off during the week. Another point in the proposed conditions was that the men would be liable to lose a day's work—working five days instead of six. He did not wonder at the men objecting to the system. If it was put to them that there was a prospect of Sunday work being abolished within a reasonable time, he thought there would be no difficulty in getting the men to accept the conditions. Instead of an advance of wages, there was a great probability that during two or three months in the summer they would only receive five days' pay per week—a contingency that was never contemplated by the men.

Mr. RATCLIFFE pointed out that the object of the Committee was to secure that as many men as possible should have six shifts a week, rather than that a smaller number should work seven shifts. He suggested that the Committee should give the advance next pay-day, and leave the men to accept or refuse the conditions.

Mr. FLINTHAM seconded Mr. Connellan's amendment.

Alderman LOWDEN was strongly opposed to the matter being referred back to the Committee. As to the question of five days' work a week, he read the following written statement by Mr. R. H. Townsley, the General Manager: "The men would only have five shifts in a week when the storage capacity on any given Sunday was insufficient to hold an extra quantity of gas made over that sold. This would only happen occasionally." Replying to Mr. Connellan's statement that there was no gas-works in the kingdom where the proposed conditions were in existence, he said the Leicester conditions were on precisely the same lines; the only point of difference being that, whereas in Leeds they were going to pay time-and-a-half for Sunday work, the Leicester Corporation only paid ordinary time.

The amendment was defeated by nineteen votes to nine.

We learn that the local officials of the Gas Workers and General Labourers' Union are rather sore at the attitude taken up by Alderman Lowden on the question of the conditions which the Committee have attached to their offer of an increase of 4d. per shift. According to Alderman Lowden, the object of the conditions is to provide employment for more men; but Mr. Walter Wood, the men's organizer, doubts the sincerity of this view, and contends that if it were the case the Committee would have got the retorts to work which are standing idle. It is also asserted that the new rules will do away with the services of five men on each shift. Meetings are to be called to discuss the situation.

COVENTRY GAS MANAGERSHIP.

At the Meeting of the Coventry City Council last Tuesday—the MAYOR (Alderman Tomson) in the chair—the Gas Committee presented a report on the subject of the appointment of a Manager of the gas-works, in succession to Mr. George Winstanley. The matter had been under consideration by a Sub-Committee, who submitted a series of recommendations, given in the "JOURNAL" last week (p. 1748), setting forth the conditions of the new appointment, and had fixed the remuneration at £600 per annum.

Mr. ROTHERHAM (Chairman of the Gas Committee), in moving the adoption of the recommendations, dealt with each in succession. He pointed out that the Corporation were about to erect new gas-works, which would be very costly, and therefore it would be folly not to have a really good Manager for them. The salary was fixed at such a figure as to be almost certain to bring applications from some of the best men in the kingdom. They were not at all desirous of paying too high a salary; but this was not a disproportionate one, looking at the amount of work and responsibility which the new Manager would have. With regard to the last recommendation, which was to authorize the Sub-Committee "to confer with the Auditors as to the forms of periodical returns to be made by the Manager, and to obtain from an expert a report upon the productive capacity of the present works," he explained, in answer to questions which had been put to him, that from time to time certain reports had been made by the Gas Manager to the Committee. At the present time they did not think the reports were sufficiently explicit; and they deemed it advisable that every information which was of use or interest to the Committee should be placed

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 22.

Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 11	10½	Alliance & Dublin 10 p.c.	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	Jan. 2	5	Australian 5 p.c. Deb. .	9⅞—10 *	+1⅛	4 19 0
200,000	5	Nov. 13	6½	Bombay, Ltd. . . .	6¼—6⅝	..	4 16 4
40,000	5	,,	6½	Do. New, £4 paid	4⅜—4⅝	..	5 9 5
380,000	Stk.	Aug. 15	12	Brentford Consolidated	265—270	..	4 8 11
270,000	,,	,,	9	Do. New . . .	192—197	..	4 11 5
50,000	,,	,,	5	Do. 5 p.c. Pref. .	130—135	..	3 14 1
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb. .	112—115	..	3 9 7
220,000	Stk.	Sept. 12	10	Brighton & Hove Orig.	213—218	+1	4 11 9
246,320	,,	,,	7	Do. A. Ord. Stk. .	150—155	..	4 10 4
420,000	20	Sept. 27	10	British.	41—42	..	4 15 3
50,000	10	Aug. 15	12	Bromley, Ord. 10 p.c. .	24—26	..	4 12 4
82,850	10	,,	9	Do. 7 p.c. . . .	19—21	..	4 5 8
500,000	10	Oct. 11	6	Buenos Ayres (New) Ltd.	9½—10	+⅛	6 0 0
220,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	94—97*	+⅛	4 2 6
150,000	20	July 17	8¼	Cagliari, Ltd. . . .	22—24	..	6 17 6
100,000	10	Sept 27	10	Cape Town & Dis., Ltd.	14¾—15½	..	6 9 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
550,000	Stk.	Oct. 11	12	Commercial Old Stock	265—270	..	4 8 11
236,425	,,	,,	9	Do. New do. .	203—208	..	4 6 7
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	130—135	..	3 6 8
800,000	Stk.	,,	9	Continental Union, Ltd.	162—167	..	5 7 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	160—165	..	4 4 10
575,000	Stk.	Aug. 29	5	Crystal Palace Ord. 5 p.c.	122—127	..	3 18 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—128	..	3 18 2
486,090	10	July 17	10½	European, Ltd. . . .	19—20	..	5 5 0
354,060	10	,,	10½	Do. £7 10s. paid	14—15	..	5 5 0
15,079,885	Stk.	Aug. 15	4 1/16	Gas-light and Coke { 4 p.c. Ord. . .	97—99	..	4 8 10
2,600,000	,,	,,	3½	3½ p.c. max.	88—90	..	3 17 9
2,799,735	,,	,,	4	4 p.c. Con. Pret.	111—114	..	3 10 2
4,063,425	,,	Dec. 13	3	3 p.c. Con. Deb.	91—93	+1	3 4 6
70,000	10	Nov. 13	8	Hongkong & China, Ltd.	13—14	..	5 14 4
3,800,000	Stk.	Nov. 13	10	Imperial Continental .	208—213	..	4 13 11
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
561,000	Stk.	Aug. 29	10	Liverpool United A	232—234	..	4 5 6
718,100	,,	,,	7	Do. do. B	170—173	..	4 0 11
306,083	,,	June 28	4	Do. do. Deb. Stk.	119—120	..	3 6 8
75,000	5	Dec. 13	4	Malta & Medn., Ltd. .	4½—5	..	4 0 0
560,000	100	Oct. 1	5	Met. of { 5 p.c. Deb.	105—108	..	4 12 7
250,000	100	,,	4½	Melbourne { 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	Nov. 13	3½	Monte Video, Ltd. . .	9—10	..	7 0 0
717,946	Stk.	Aug. 9	8½	Newc'tle & G'tesh'd Con.	214—216	..	3 18 8
312,855	Stk.	Dec. 27	3½	Do. 3½ p.c. Deb.	98—10.*	..	3 10 0
150,000	5	Nov. 28	8	Oriental, Ltd. . . .	7⅞—8	..	5 0 0
135,000	5	,,	8	Do. New, £4 10s. pd.	6¾—7⅛	..	4 19 4
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1⅜	..	4 11 5
63,000	5	Sept. 27	7	Ottoman, Ltd. . . .	8⅜—8⅝	..	5 12 0
					* Ex. div.		

Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
851,070	10	Oct. 11	7	River Plate Ord. . .	10—10¾	+⅛	6 13 4
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. .	94—97*	+1½	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd. . . .	11—12	..	6 13 4
135,000	Stk.	Sept. 12	10	Sheffield A	242—244	..	4 2 0
209,984	,,	,,	10	Do. B	241—243	..	4 2 4
523,498	,,	,,	10	Do. C	241—243	..	4 2 4
5,761,885	Stk.	Aug. 15	5	South Met., 4 p.c. Ord.	123—125	..	4 0 0
1,627,965	,,	July 17	3	Do. 3 p.c. Deb. . .	92—94	..	3 3 10
380,940	Stk.	Nov. 13	5	Southampton Ord. . .	102—106	..	4 14 4
70,825	,,	July 17	4	Do. 4 p.c. Deb.	104—109	..	3 13 5
120,000	Stk.	Aug. 29	5½	Tottenham and Edmonton { A. 5 p.c.	122—127	..	4 6 8
250,520	,,	,,	4	B. 3½ p.c.	95—100	..	4 0 0
182,380	10	Jan. 16	5	Tuscan, Ltd.	7½—8½	..	5 17 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	95—98*	+1½	5 2 0
230,000	5	Aug. 15	9	West Ham, 10 p.c. . .	9½—10⅛	..	4 5 9
172,000	10	,,	6	Do. 7 p.c. . .	12½—13½	..	4 8 11
140,900	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	105—110*	..	3 12 9
				WATER COMPANIES.			
780,599	Stk.	Dec. 30	11¾†	Chelsea, Ord. . .	310—320*	−4½	3 11 11
150,000	,,	,,	5	Do. 5 p.c. Pret. .	150—155*	+½	3 4 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	138—143*	+¼	3 2 11
175,785	,,	Sept. 27	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
1,720,560	Stk.	Oct. 11	7	East London, Ord.. .	198—203	−2	3 9 0
1,018,046	,,	,,	3	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
654,740	,,	Dec. 13	4½	Do. 3 p.c. Deb. .	95—97	..	3 1 10
700,000	50	Dec. 13	8	Grand Junction { 10 p.c. max..	113—116	..	3 9 0
310,000	Stk.	Sept. 27	4	4 p.c. Deb..	122—126	..	3 3 6
708,000	Stk.	Aug. 15	14	Kent	300—305	..	4 11 10
160,000	,,	,,	7	Do. New, 7 p.c. max..	200—205	..	3 8 4
1,043,800	100	Dec. 30	10½	Lambeth, 10 p.c. max..	293—298*	+½	3 10 6
406,200	100	,,	8	Do. 7½ p.c. max..	217—224*	+3	3 12 1
350,000	Stk.	Sept. 27	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
500,000	100	Aug. 15	12,8/10	New River, New Shares	395—405	..	3 3 2
1,000,000	Stk.	July 31	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
902,300	Stk.	Dec. 13	7	South-wark and Vauxhall { Ord. . .	193—198	..	3 10 8
126,500	100	,,	7	7½ p.c. max.	183—188	+1	3 14 6
489,200	Stk.	,,	5	5 p.c. Pref. .	150—155	..	3 4 6
1,019,585	,,	Oct. 11	4	4 p.c. A Deb.	124—129	..	3 2 0
1,155,066	Stk.	Dec. 13	10	West Middlesex. . .	280—290	..	3 9 0
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	137—142	..	3 3 5
200,000	,,	Sept 12	3	Do. 3 p.c. Deb. .	56—98	..	3 1 3
					* Ex. div.		

before them monthly. With regard to the expert, they were not experts on the Gas Committee; they did not, of their own knowledge, know sufficient to check any report that might be made by the Manager. There were many things that it was desirable for members of the Committee to know, and therefore the recommendation was made that they should have some entirely independent advice upon the elementary facts which they had coming to them in their reports. It must not be taken that there was any discredit upon any person, neither did it imply that they did not implicitly trust their Manager; but it was desirable that the Committee should have as much gas education in a terse and concise form as possible. He added that the recommendations were accepted by the Committee with only one dissentient, and he had great pleasure in proposing that they be adopted by the Council, and that the matter be remitted to the Committee for further action.

Alderman BOOTH seconded the motion.

Alderman ANDREWS moved, as an amendment, that the report be referred back, with the view to the re-engagement of the present Manager. He urged that no complaint had been made against Mr. Winstanley, whose patents they had used (at a saving of £2000 yearly) without paying him a penny in the shape of royalty. The whole of the retorts at the works, some 300 in number, had been erected according to his patent. With regard to certain objections which had been raised, he (Alderman Andrews) would point out that Mr. Winstanley had strictly adhered to the terms of his agreement. He was privileged, under his agreement, to carry on other business in conjunction with that of the management of the gas-works; and he had gone no farther than he was allowed. There had never been any complaints against Mr. Winstanley; and no complaint had been made against him that morning. His management of the undertaking had been thoroughly satisfactory, both to the Council and the ratepayers. In fact, he had managed the concern with distinguished ability and success for the last sixteen years. Therefore he (Alderman Andrews) thought it was a great mistake—a most serious mistake—to have given him notice to terminate his engagement. Hence the reason for the amendment. He might remind the Council that during Mr. Winstanley's management they had been able to reduce the price of gas in Coventry to the same as it was in Birmingham and Leicester, where the manufacture was enormously greater than it was in Coventry, and where they were about 20 miles nearer the coalfields, and consequently had less carriage to pay. During the same time £36,000 had been paid in relief of the rates, besides which they had £5000 in the reserve fund, making more than £40,000 altogether. If any change were made, they were not likely to improve upon Mr. Winstanley; in all probability they would do a good deal worse.

Mr. CALCOTT seconded the amendment, suggesting that it should be altered so as to refer the question to the Council in Committee.

Alderman ANDREWS was willing to adopt the suggestion.

Alderman MARRIOTT supported the amendment; remarking that in so personal a matter as this, the Council should have every opportunity of exchanging their views and opinions in Committee.

Mr. ROTHERHAM pointed out that the recommendations which he had laid before the Council related to the engagement of a new Manager, and had nothing whatever to do with what had passed between the Gas Committee and the present Manager. He was ready at any moment to discuss the question with any member of the Council.

It was eventually decided to further consider the matter in Committee. After a full discussion, which lasted for upwards of an hour, the amendment originally proposed by Alderman Andrews was defeated, and the recommendations were adopted.

LIGHTING PRIVATE STREETS.

The General Works and Highways Committee of the Nottingham Corporation have been inquiring into the above matter; and a digest of their report may be useful to others. The question was referred to the Committee by the Council after a discussion on Dec. 2; so that the Committee have not lost time in reporting upon the subject. They state that they are advised that until private streets are paved and completed to the satisfaction of the Corporation under the provisions of the Public Health Act, 1875, and become highways repairable by the inhabitants at large, such streets cannot be lighted at the public expense. The Lighting Committee, however, are prepared to light such streets on the owners of the properties signing an undertaking to pay the annual cost of the gas, and of lighting and cleaning the necessary lamps until the streets are completed and taken over as public highways. Several partially-paved private streets have been lighted under this arrangement. The report goes on to state that, in addition to the private streets, there are many private yards which in all probability will never become public. Some few of these are lighted either directly by the owners, or by the Lighting Committee at the annual expense of the owners. Many complaints have been made as to the want of light in these yards (often containing a very considerable population), but they cannot be lighted at the public expense as they are private, and will probably always remain the property of the owners of the houses abutting on the same. The Committee are of opinion it is important that the above-mentioned private streets and yards should be adequately lighted; but at present they possess no power to compel the owners to do more than put up the means of lighting—that is to say, the necessary lamps. The Committee therefore recommend that application should be made to Parliament, in a future Bill, for power to enable the Corporation to light such private streets and yards, and to charge the cost thereof to the owners or occupiers of the properties abutting thereon, by means of a special rate to be levied for that purpose and collected with the general district rate.

The name of the Examinations Department of the City and Guilds of London Institute has been changed to the Department of Technology. All communications for the department should be addressed to the Superintendent (Sir Philip Magnus), Department of Technology, City and Guilds of London Institute, Exhibition Road, S.W.

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BRIDPORT GAS-WORKS FLOODED.

The recent heavy rains have had serious results at Bridport, which, standing at the confluence of the Rivers Brit and Symene on the one side and the Asker on the other, is particularly liable to be flooded in the lower levels. Last Saturday week, there was an exceptional downpour; and the anxiety created thereby proved by subsequent events to be justified. About nine o'clock at night, the water began to show itself through the road gratings at the bottom of South Street, and soon the roadway became submerged. Among the various buildings invaded by the flood, was the gas-works, where the water, having flooded the yard and made its way into the stove and fittings show-room, finally flowed into the subway of the retort-house. The Manager (Mr. J. H. Cornish) immediately set to work a steam pump, kept on the spot for such emergencies; but he found the flood was overpowering the pump, and gradually rising. Seeing the danger of a steam explosion if the water reached the heated flues, Mr. Cornish sent off an urgent request to the fire brigade for the use of their engine. No time was lost in getting together the men, and the manual engine was hauled to the works to assist in averting what might have been a very serious catastrophe. The brigade commenced pumping soon after half past one in the morning, and kept on until about half past six, when all danger was over. Mr. Cornish is to be congratulated on his promptness in dealing with an emergency which might have resulted in great loss to the town; for had the water reached the flues and caused the explosion that was feared, gas making might have been at a standstill for some weeks.

LONGTON GAS AND ELECTRICITY SUPPLY.

The principal work of the Longton Corporation during the past year has been the establishment of their electric light undertaking. The gas-works (which are under the management of Mr. W. Langford) are making a gratifying return to the rates; but the Electricity Department has yet to prove what it can do in this direction, for the inauguration took place only in September. It appears to be recognized locally that the electric light works (which have cost about £20,000) will show a debit balance for some time; but it is hoped that this state of affairs will not last very long. One result of the installation is that it has already affected the output of gas to the extent of decreasing the consumption by about 2 million cubic feet, as compared with the previous year; but the Gas Committee are seeking to balance matters by extending the use of gas in cottages, through the offer of putting in fittings under certain conditions. Since Oct. 1 last, the price to ordinary consumers has been lowered by 3d. per 1000 cubic feet; while the prepayment meter consumers have had the benefit of 4d. reduction.

We are informed that the dividend warrants for the interest on the 5½ per cent. preference shares of the Davis Gas-Stove Company, Limited, for the half year ended the 31st ult. have been posted.

GAS POISONING CASES.

A woman has recently died at Derby through, it is conjectured, having failed to turn the gas off properly. On retiring to bed with her husband, she put out the light, and some time afterwards the husband awoke and found that the room was full of gas. He was almost overpowered, but managed to procure assistance. His wife, however, was by that time quite dead. On Monday morning last week, the Manager of the City Temperance Hotel, Glasgow, noticed a strong smell of gas proceeding from one of the bedrooms. He entered, and found a man lying on the bed unconscious. The room was full of gas; and on examination, the tap of the bracket was found to be turned full on. The man was taken to the Royal Infirmary, where he recovered consciousness. According to evidence given at a Coroner's investigation at Ilford a few days ago, gas smoothing-irons are liable to be sources of danger. While Alice H. Calcott was using one, an escape took place from the tubing, and she was overpowered—death following. It was decided that this was due to asphyxia caused by the inhalation of the gas; and the Jury returned a verdict of "Accidentally suffocated."

ELECTRIC LIGHTING NOTES.

Cheapened Electric Light for Poplar.

The Electricity Committee of the Poplar Borough Council have resolved on an important reduction in the charges for electricity supplied from the Council's installation, which will bring the benefits of the light within the reach of the general public. It has been decided that the charges for private lighting shall be at the rate of 5d. per unit for the first hour's use per day, and 3d. per unit for all subsequent consumption; and that the power rates to consumers of more than 250,000 units per annum shall be reduced to 1½d. per unit.

St. Helens Extensions.

At the conclusion of the meeting of the St. Helens Town Council last Thursday, the members and officials proceeded, at the invitation of the Mayor (Colonel W. W. Pilkington), and the Chairman of the Electric Lighting Committee, to the electricity works to witness the ceremony of "christening" a new engine and to start the extensions of plant. The principal addition to the plant is a 600-horse power Willans engine coupled to a dynamo of 330 kilowatts capacity. This brings the total capacity of the station up to 2400-horse power, or 1340 kilowatts. So great, it is stated, has been the development in the use of electricity in the borough that even this addition will not suffice for long; and the Electricity Committee have in contemplation a scheme under which there will be a considerable enlargement of the buildings and plant.

Maidstone Public Lighting.

The little disagreement between the Maidstone Corporation and the Gas Company as to the terms for maintaining, lighting, and cleaning

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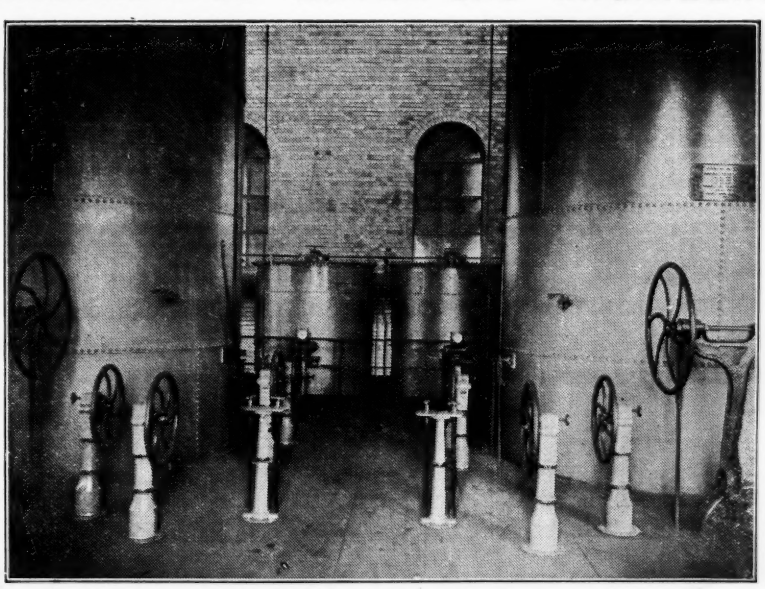

RESULTS PROVE EFFICIENCY.

Working Floor of Generator House. One-Fifth Section of Birmingham Plant, Windsor Street Station.
The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 12 MILLION CUBIC FEET.

the street gas-lamps (which have now been lessened in number by the advent of the electric light) is the subject of a letter by Mr. George Marsham, the Chairman of the Company. The reason for the increase in the charge is practically that given in our recent reference to the matter. But the letter states that there need be no question of leaving the town in darkness; for, if the Corporation do not wish to accept the terms, the Company are quite willing to render a detailed account, at the end of each half year, of the actual cost, and to accept such in lieu of the fixed charge—a reasonable sum, of course, being charged for the hire of standards, furniture, &c. This proves the fairness of the Company's position.

Sleaford Electric Lighting Still Unsatisfactory.

The electric light does not appear to be doing thoroughly good duty yet at Sleaford. At the meeting of the Urban District Council last Wednesday, the report of the Electric Lighting Committee contained the statement that the unsatisfactory condition of some of the arc lamps had again been considered, and it was suggested that no more money be paid to the Contractors until the defects had been rectified. Mr. Bates, in moving the adoption of the report, had nothing at all to say in regard to this subject, except that two or three of the arc lamps were not working properly; but the matter was having attention. Another cause of complaint came before the Council. By an oversight on the part of the Committee, the lamps were not kept alight on New Year's morning, and so the congregations who had attended Watch Night services had to find their way home in the dark. A local paper says the oversight was unfortunate, as it led to a breach, by the more hasty, of some of the good resolutions they had just made.

Long Eaton Inquiry.

The ratepayers of Long Eaton are anything but unanimous in their desire to possess an electric light installation; and at an inquiry held last Wednesday by Colonel W. Langton Coke in regard to the application of the Long Eaton Urban District Council to the Local Government Board for sanction to borrow £15,000 for this purpose, the opposition had a good deal to say. Mr. J. H. Crowther, who had prepared the scheme, said he "expected" the cost of generating current, exclusive of office expenses, would be 1¼d. per unit; and he argued that the electric light would be safer and better for the factories than gas. In the course of the proceedings, it transpired that the Derbyshire and Nottinghamshire Power Company had offered to supply current at 2d. per unit; and it was contended that, as the Company had a site about 3½ miles away, and there would be a loss of only 1½ per cent. in transmission, it would have been better for the Council to take advantage of this proposal than to erect a station of their own. Mr. Pritchard, who appeared for the Gas Company and other ratepayers, said the generating cost would be between 3d. and 4d. per unit, instead of as stated by Mr. Crowther. The streets were more successfully lighted with incandescent gas than with the electric light. He argued that the Council could be supplied at a cheaper rate by the Power Company than by putting down plant themselves. Besides, they would have to risk competition. The Power Company had authority to supply current with the consent of the Council; and if the latter declined their consent unreasonably, the Company could apply to the Board of Trade.

Explosions in Electric Light Boxes.

A series of explosions took place in the City last Saturday afternoon and early on Sunday morning, resulting in injuries to several persons, besides plunging a considerable area, including Newgate Street, Smithfield, and Ludgate Hill, in total darkness. Shortly after two o'clock on Saturday afternoon, smoke was observed by a constable to be issuing from one of the conduit-boxes opposite St. Sepulchre's Church, adjacent to Newgate, on the City side of the Holborn Viaduct, and also from another box in the footway a short distance off—both belonging to the Charing Cross and Strand Electric Lighting Company, Limited. The Company's emergency staff were sent for, and, on their arrival, the lid was removed from the boxes to allow the smoke to escape more freely.

Meanwhile, dense volumes of smoke were seen issuing from a box opposite No. 80, Newgate Street; and when the cover of it was removed an explosion occurred, followed by a large body of flame. Thomas Tewson and Herbert Perry, both in the Company's employ, were burnt about the face and hands; the former so seriously that he was taken to St. Bartholomew's Hospital, where he was detained. Two passers-by complained of being hurt. While the carriage-way in Newgate Street was being opened for the purpose of effecting a resumption of the service, an explosion occurred in a brick chamber close by belonging to the City of London Electric Light Company. The cover of the chamber was broken, and a portion of the footway torn up. A few minutes afterwards another explosion took place in a chamber opposite No. 78, Newgate Street; and in this case a person was injured and the footway in the immediate vicinity of the accident was a good deal damaged.

Owing to these accidents, the traffic for about an hour had to be diverted. Considerable damage was done to the electric light wires, a great number of which were fused. A peculiar effect of the accidents was to damage the tube used for conveying messages from the Ludgate Circus Post Office in New Bridge Street to the General Post Office for transmission to the Provinces. These were necessarily greatly delayed, as they had to remain in the tube until it was repaired. Commander Wells, in his official report, ascribes the fire to a "defective electrical current," and states the damage to be "some insulated wire cable, two distributing boxes, and about 4 feet by 4 feet of pavement damaged by fire and breakage."

There was a precisely similar occurrence twelve hours later on Ludgate Hill; for at 2.22 a.m. on Sunday the firemen were turned out to find dense volumes of smoke issuing from one of the boxes of the City of London Electric Lighting Company, at the corner of the Old Bailey. The pavement had again been blown up, and the great burst of flames had slightly scorched a shop-front. Here the insulated wire cables had become ignited through a defective electric circuit; and it was not until the wires had been severed that the outbreak could be overcome.

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CARDIFF WATER EXTENSIONS.

An inquiry on behalf of the Local Government Board was held at Cardiff on Thursday last, by Colonel W. R. Slacke, relative to the application of the Corporation for sanction to borrow additional money for water-works and other purposes. The Water Engineer (Mr. C. H. Priestley) gave details of the proposed extensions at Rheubina and Cogan, the new reservoir at Leckwith, and filter-beds and service reservoir at the Heath, &c. He explained that a sum of £91,000 would be required to carry out the work contemplated. It is also proposed to enlarge the limits within which the Corporation are authorized to supply water so as to include St. Fagan's; and this gave rise to some opposition. It was, however, stated by the Town Clerk (Mr. J. L. Wheatley) that a minimum rental had been guaranteed by St. Fagan's, which would provide against any loss.

NECESSITY FOR NEW WATER-WORKS AT NOTTINGHAM.

The Consulting Water Engineer of the Nottingham Corporation has submitted a report as to the necessity of the water-works being included in the Corporation Bill of 1902. The report stated that in the Nottingham Corporation Act of 1899, among the works sanctioned were a covered reservoir at Redhill, a covered reservoir at Greasley, and an aqueduct to connect the existing mains of the Corporation with the Greasley reservoir; and the parliamentary estimates for these works amounted to £32,584. Unfortunately, the coal working in the neighbourhood has rendered it inadvisable to construct additional reservoirs either at Redhill or at Greasley if other sites could be obtained which would effect the same purpose without running as much risk. In lieu of the Redhill and Greasley reservoirs, after much patient consideration, the Water Committee propose to make a small and inexpensive reservoir at Watnall, which would enable them to give a proper supply to the whole of the high districts in the neighbourhood, and which districts lie at about the same elevation as the Mapperley Plains Road. In substitution for the proposed new Redhill reservoir, one has been projected at Wilford Hill; and a reservoir in this position possesses a great number of advantages over additional storage at Redhill. In the first place, the whole of the storage is now on the north side of the city, and the trunk mains supplying the reservoirs overlie a coalfield from which the coal is being continually abstracted; and the Committee have in the future to look forward to the risk of damage to the mains. With the whole of the storage on one side of the city, should any accident happen to the trunk mains, very grave trouble and inconvenience would accrue during the period required to put the mains in working condition again. With a storage reservoir at Wilford Hill, the inconvenience would be minimized, and in addition a proper pressure would be given to West Bridgford and the whole of the Meadows district (in which district a great demand for water has arisen within the past two or three years by the Railway Companies), and the fire supply would be enormously improved. The Park Row reservoir has for some time past been in an unsatisfactory condition, and cannot be filled to a greater depth than 10 feet without leaking; and as this reservoir is at too low a level to furnish sufficient pressure for the Meadows and West Bridgford districts, it is considered inadvisable to spend money on reconstruction or repair. In fact, the reservoir should be abandoned, and the site sold.

EXMOUTH WATER ARBITRATION.

It is reported that the award in the matter of the compulsory purchase of the undertaking of the Exmouth Water Company by the Exmouth Urban District Council has been received; but it will not be made public until it has been taken up by the Council on paying the costs, £431. The Arbitrators were Mr. Hawksley for the Water Company, and Mr. Hill for the Council. Sir F. Bramwell was Umpire. The valuation of Mr. Rofe, one of the Engineers called in on behalf of the Company, was (based on a 36 years' purchase) £76,934, after making deductions for providing additional storage, relaying mains, and for pipes requiring renewals, as well as sand for the filter-beds, amounting altogether to £3314, and adding 1½ per cent. for cost of, and delay in, reinvestment, which he put at £1136. It was, however, exclusive of the cost of winding-up, and the amount to be added in respect of debentures which are paid off. Mr. Middleton, the other Engineer for the Company, based his valuation on the same principle, and brought it out at £79,122, from which he deducted £3302, making the net amount £75,819. This he increased to £76,956, by additions for cost of reinvestment, &c. Mr. Strachan, the Council's Engineer, made his estimate £65,733, to be reduced to £64,770 by all deductions, with the exception of an amount in respect of the scraping of the mains, to be fixed after examination. Mr. Deacon, who also gave evidence for the Council, working on a basis of 33 years' purchase, which he considered a fair one, assessed the price at £63,538; but he reduced this to £60,512 by deductions. In addition to fixing the sum to be paid by the Council for the undertaking, the Arbitrators also had before them the disputed charge of the Company to the Council for water used for street purposes, &c., which the Company had increased from £100 to £120 a year.

A Big Burst.—Considerable damage was caused to the roadway in the neighbourhood of Crown Point, Denton, last Thursday, by the bursting of a 40-inch water-main belonging to the Manchester Corporation. At this spot there is a perfect network of mains, ranging from 15 to 40 inches in diameter; and this made the task of repairing the damage all the more difficult. The accident caused no interference with the city's water supply, as the main which burst simply feeds the storage in the reservoirs.

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From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners held their concluding meeting for the year last Monday, with Provost Mackie, of Leith, in the chair. The report of the Engineer (Mr. W. R. Herring) showed that since May 16 there had been an increase in the output of gas, over the corresponding period of last year, of 16,302,000 cubic feet, and that there had been 1693 new cookers fixed—the number now on hire being 5911. It was also reported that during the month of November the works had been much more heavily taxed than they had been since the Commission came into existence. They had been running very closely up to what they possibly could do. During the past month, they had had an output 5 per cent. greater than they ever had before. The Engineer had been obliged to reduce the pressure, in order that he might be able to supply their customers. This statement was regarded as very satisfactory. Sir Andrew M'Donald said that one of the most important pieces of work they had before them was a question which had arisen between them and one of their Contractors at Granton. Mr. Herring and the Committee had done everything they possibly could to bring about what he believed to be a liberal settlement; but evidently this was not what was wanted, for even that morning, and for the first time, there had been sent in a long list of extras, running into between £300 and £400. The recommendation of the Works Committee was that the matter might be referred to three or four men of skill to be nominated by the respective parties, by whose decision the Commissioners would be prepared to abide. The Committee thought they had a very good case, and if the other side took a sober view of it, and came to terms, they would get the thing cleared out of the way. The Chairman remarked that, failing this, they must just go into Court, to which Sir Andrew M'Donald replied that it was for the other side to take them into Court. The Commissioners said the account was bigger than it ought to be—that was the whole thing. The matter was sent to the Finance and Law Committee, on the understanding that the recommendation of the Works Committee should be first given effect to. I understand the Contractor referred to is Mr. A. Forbes, jun., of Edinburgh, who had a contract for the erection of stonework at Granton, as distinguished from the brickwork of the buildings.

The Clerk (Mr. J. M'G. Jack) intimated that the North British Railway Company had given notice that they were about to promote a Provisional Order for the construction of a new railway; and as he was informed that the railway would interfere with some of the Commissioners' property, he had sent in the usual notice of dissent. He had communicated with the Solicitor of the Company, asking if the Company would put in a clause for the protection of the Commissioners; but he had replied that he preferred they should take the usual course of lodging a petition against the measure. Mr. Herring explained that the locality was in Duddingston Road, where the Commissioners had a 15-inch trunk main. The Railway Company proposed to erect a bridge over it, and to lower the level of the roadway. Sir Andrew M'Donald asked, with some heat, if the Railway Company declined to protect their property, and proposed to drag the Commissioners to London, or wherever the case was to be heard, at considerable expense. The Clerk said this was the usual course. Mr. Mallinson remarked that it was customary to lodge a petition, and to come to terms afterwards. It was agreed to formally petition against the Order. The Clerk then said the Caledonian Railway Company had also intimated that they were about to apply for a Provisional Order; but they had given the Commissioners no notice, probably thinking that it did not affect them. On a question as to how it did affect them being put, Mr. Herring explained that the Company had scheduled a large piece of ground, built on, at Easter Road. The Commissioners were obliged, when buildings were erected, to place service-pipes in them. This they did—as all capital expenditure was made—on the understanding that they would be recouped for the outlay in a certain number of years; but if a railway company came along, say two years after the property was built, and swept it away, and did not pay for the service pipes, the Commissioners lost them as well as their customers in the houses. He thought they should be compensated for such loss. It would not pay the Commissioners to take out the service-pipes; but if they were allowed to stand, they might be good for thirty years. Of course, if the Railway Company did not pull down the houses, they did not ask for anything. In connection with railway operations at Leith Walk, an enormous amount of property was pulled down; and the Commissioners received nothing at all for their service-pipes. They therefore suffered a loss of several hundred pounds. They tried to negotiate, but found that they had no grounds to go upon. It was agreed to intimate dissent from the Order.

Mr. Manclerk introduced the subject of laying gas-mains upon railway bridges, and asked how the Commissioners were affected in such instances. Mr. Herring explained that the Commissioners had power to lay mains in all roads, with a cover of 3 ft. 6 in.; but it was found that railway companies, when they erected a bridge, sometimes did not allow sufficient cover for the laying of a 4-inch main. The Commissioners then had to place their main round the outside of the bridge, at great expense, and where it was exposed to dangers which it should not be. He thought that in such a case railway companies should be compelled to lay a culvert for the gas-mains. This subject also was sent to the Finance and Law Committee.

Bailie Kinnaird, of Leith, moved that responsible officials be instructed to furnish to the Commissioners the amount spent on Granton House and grounds since the Commissioners took over the property. A letter from Bailie M'Kelvie, of Leith, who was absent, was read, to the effect that he called upon Mr. Gibb (the Treasurer) previous to the last meeting, but was informed that it was impossible for him to give the information, as payments for several matters, including Granton House, had all been mixed up, and the Commissioners would require to have them re-allocated. The Auditor was also asking for those payments to be allocated. In his (Bailie M'Kelvie's) opinion, the mixing up of accounts in this way had either been done for the purpose

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of preventing such information as he asked being given, or the system of book-keeping was defective. The motion was unanimously sent to the Finance and Law Committee. Mr. Gibb explained that Bailie M'Kelvie had taken quite a wrong impression from what he said to him in their two minutes' interview. What he wished to convey to him was that there were a number of very delicate questions to be considered as between revenue and capital expenditure—so difficult that he might require to bring the matter before the Commissioners—and that, in these circumstances, although the books were kept in the most perfect order, the question was mixed up with a suspense account, which amounted to over £4000. The Auditor's position was that he objected to all suspense accounts being carried on from year to year. The subject then dropped; and this concluded a longer list than usual of interesting business.

There is a person in Broughty Ferry, of whom I have written before, who makes periodical attacks on the conduct of those in charge of the Corporation gas undertaking. He writes anonymous letters, as all his tribe do. Last Saturday, he had a communication in the "Dundee Advertiser," in which he started off with the swelling remark that "another winter has come, and still the long suffering people complain of the most unsatisfactory gas, in spite of the hopes of improvement that had been held out." He then goes on to complain that the illuminating power has been reduced, in order to make the gas more suitable for cooking and heating purposes; and finishes up with a lament that it had fallen from over 30 candles to 22 or 23 candles. He gives, to local people, some clue as to his identity, in the remark that he is one of the oldest residenters in Broughty Ferry. But whether he be identified or not, it is clear that he is "one of the olden time," who does not see benefit in changes of any sort. In Monday's issue of the same newspaper, there was another anonymous communication, also unfriendly, the burden of which was that the management of the gas-works seem to be more intent upon making coke to undersell coal, and gas for cooking and heating purposes, to be sold at a loss, than upon turning out a satisfactory lighting gas. The writer of this letter may be a coal merchant. At least, the drift of his remarks is in the direction of the duty of the Corporation being to buy dearer coal for gas making, and not to compete with the trade by selling coke or gas for heating.

At a recent meeting of the Directors of the Kilwinning Gas Company, Ayrshire, it was resolved to allow a discount of 2½ per cent. to consumers of 100,000 cubic feet of gas, and 5 per cent. to consumers of 200,000 cubic feet and upwards, by way of encouraging its use more largely for industrial purposes.

The other day a fire broke out in a shop in Hanover Street, Edinburgh, and did damage which is reported to be considerable. It has been ascertained that it was caused by the fusing of an electric light wire, which, in turn, led to the melting of a gas-pipe and the ignition of the gas. The incident shows how essential it is, in introducing the new lighting arrangements, to see that they do not overlap the gas-fittings.

Great inconvenience has been felt at Earlston, owing to the flooding of the gas-works, which are situated in close proximity to the Trufford Burn. The water made its way into the pipe conveying the gas from the purifiers to the holder; and, notwithstanding the most strenuous exertions, it could not be stopped, so that no gas could be supplied to the town.

The Corporation of Arbroath are not likely to enjoy much happiness in the possession of their extended underground water-collecting works. They rejected proposals by the late Mr. James Wilson for the introduction of a gravitation scheme, and deliberately entered upon the doubtful policy of extending adits from the well which had hitherto furnished the pumped supply to the town. Upon this scheme they expended about £9500. The works were completed a few months ago. It is now found that the yield has been very little augmented; it is only equal to 16 gallons per head per day. Last week a letter was received from the Local Government Board, asking if the Local Authority are satisfied with the supply of water they are now getting. The Corporation have resolved not to give any opinion on the subject, but to forward to the Board a statement of the quantity of water which has been pumped daily since August last.

CURRENT SALES OF GAS PRODUCTS.

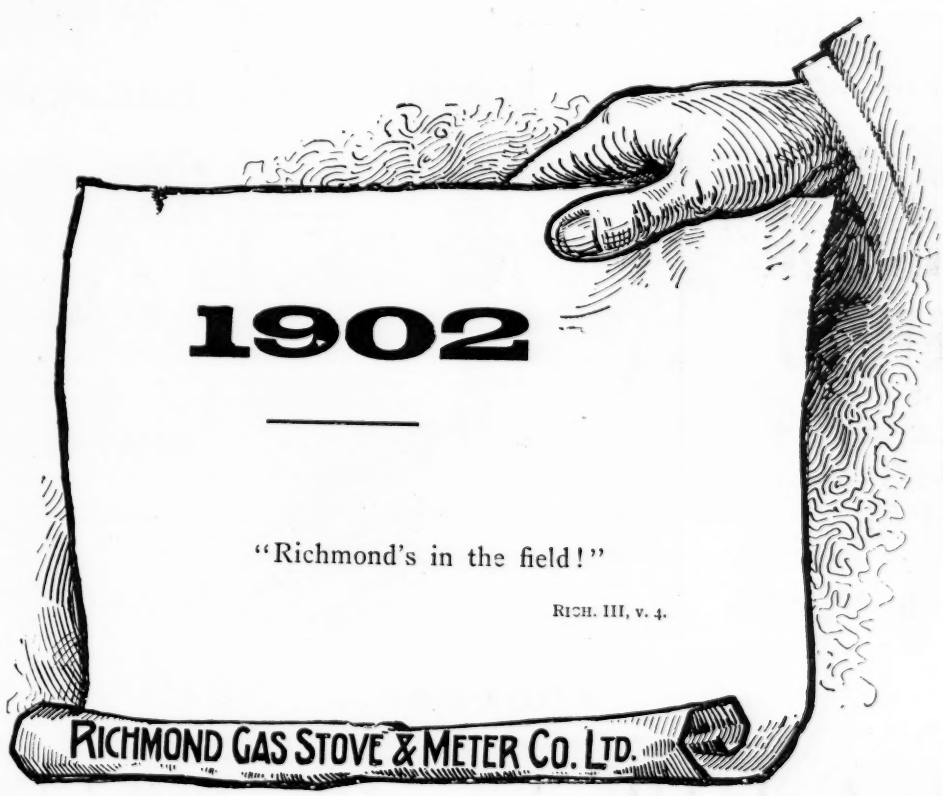
LIVERPOOL, *Jan.* 4.

Sulphate of Ammonia.—The week opened quietly, and the lowest prices for December were readily accepted; but later there sprang up a much better inquiry, resulting towards the close in a considerable amount of business at an advance from the lowest point touched. The closing quotations are £10 15s. per ton f.o.b. Hull, and £11 per ton f.o.b. Liverpool and Leith. The bulk of the buying has been done by middlemen; but whether for covering purposes or in the way of a "bull" operation is not yet apparent. Consumers have not shown much interest at anything above last week's prices. In the forward position, buyers have not made up their mind to pay makers' prices, and meantime makers remain firm.

Nitrate of Soda is firm at 9s. 4½d. to 9s. 6d. per cwt., according to quality, on spot.

LONDON, *Jan.* 4.

Tar Products.—The markets continue very quiet, and there is very little business doing, doubtless owing to the New Year. Pitch is very firm indeed; and there is a really strong demand for early shipment from London. Unfortunately, however, makers are fully contracted, and unable to supply same. There is also more business doing in the North for January-June, and prices appear to be well maintained. 90 per cent. benzol is quiet; but an offer of 10½d. has been declined for January-March—makers quoting 11d., and in some instances 11½d. over this period. In 50-90 per cent., there is no business doing at the moment. Manufacturers are open to accept 10d. for January-June; but buyers will not pay more than 9½d. Creosote is decidedly firmer in the North; there being more demand for forward delivery. In



crude carbolic, there is a fairly good business doing at 1s. 11d. for 60's, and 1s. 7½d. for 50's, for prompt and January-June delivery. Crystals remain in precisely the same position. There is no fresh business to report. As regards tar, nothing of importance has transpired during the past week.

The average values obtaining during the week are: Tar, 15s. to 18s. Pitch, east coast, 35s. 6d. to 36s. 6d.; London, 37s. 6d. to 38s.; west coast, 34s. to 34s. 6d. Benzol, 90's, 10½d. to 11d.; 50's, 9½d. Toluol, 10d. Crude naphtha 4½d.; solvent naphtha, 11d.; heavy naphtha, 10d. Creosote, London, 1⅞d.; North, 1⅛d. Heavy oils, 2½d. to 2¼d. Carbolic acid, 60's, 1s. 11d. Naphthalene, 60s. to 75s.; salts, 30s. to 45s. Anthracene, "A," 2d. to 2½d.; "B," 1d. to 1¼d.

Sulphate of Ammonia.—There is rather a better inquiry, although there is not much doing for prompt delivery. One of the largest London Companies is reported to have declined £11 for a very great quantity, prompt shipment, Beckton terms. In Hull, business is reported at £10 16s. 3d. for a small quantity for prompt shipment. In Leith, the demand is very much brisker. Business has been done at £11 for prompt, but makers ask more money for forward. In Liverpool, sales are reported of small parcels at rather lower prices; but there is a better inquiry for forward delivery from this port. Yesterday afternoon, our correspondent wrote: "The Gaslight and Coke Company have just sold a considerable quantity of Beckton at £11 5s., and are reported to have declined this price for a further quantity, as they are now asking £11 7s. 6d. in any position. The South Metropolitan Company also are reported to have refused £11 2s. 6d. for a considerable quantity early delivery. This, of course, will make the markets firmer all round; and prices may be taken as having advanced considerably. Leith is quoted at £11 2s. 6d. to £11 3s. 9d., Hull £11, and Liverpool £11 to £11 1s. 3d."

SULPHATE AND NITRATE IN THE PAST YEAR.

In the last number of the "JOURNAL," we gave some particulars as to the course of gas residual products during the past year, and quoted some figures in regard to sulphate of ammonia from the circular of Messrs. S. W. Royse and Co., of Manchester. We take the following from that of Messrs. P. R. M'Quie and Son, of Liverpool: "Sulphate of ammonia has not developed its customary fickleness. Prices have varied somewhat, but kept within a range of 20s. per ton, in spite of the exertions of speculators to lengthen the swing of the pendulum. To-day prices are scarcely 5s. per ton less than this time last year, and there is no pronounced opinion as to serious changes in the near future, although some dealers appear inclined to sell forward positions at a shade under prompt values. The feature of the year has been the new production in connection with the Mond gas process. As yet, this has not become sufficiently large to materially affect the market; but there seems no reason to doubt that it will eventually become an important factor."

In the course of their report on nitrate of soda, Messrs. W. Montgomery and Co., of London, say that the trade last year was marked by development in consumption and advance in price—the former establishing a fresh record. The visible supply on the 31st ult., compared with that on the corresponding day of the previous year, showed a deficiency of 150,000 tons; but it was expected that this would be reduced by steamer shipments from January to March in excess of those of last year by 60,000 tons. It was calculated that the following quantities might be relied upon for actual consumption to the 15th of May next: Visible supply to-day, 642,000 tons; estimated steamer shipments, January to March, 135,000 tons—total, 777,000 tons, compared with 861,000 tons a year ago. The consumption from January 1 to May 15, 1901, was 770,000 tons; so that there may be just enough on this basis to go round, with little margin for stock or for the many unforeseen emergencies which so often occur in regard to nitrate of soda. The world's consumption of this material for the past three years has been as follows: 1899, 1,330,000 tons; 1900, 1,324,000 tons; and 1901, 1,364,000 tons—the shipments having been 1,373,000 1,429,000, and 1,263,000 tons.

COAL TRADE REPORTS.

Lancashire Coal Trade.—Operations in the coal trade here have necessarily been largely interfered with by the holiday stoppages of the pits, lasting until yesterday. The lower qualities of round coal have been in active request, not so much for steam and forge purposes as for common house-fire consumption and gas-making requirements; and prices are firm on the recent basis. A brisk demand has been coming forward for the better qualities of engine fuel, supplies of which are somewhat scarce; and full rates are well maintained. The commoner sorts are also in fair request, and steady in price. At the pit, best Wigan Arley averages 15s. 6d. per ton, Pemberton four-feet and seconds Arley 13s. 6d., commom house coal 11s. 6d., steam and forge coals 9s. to 9s. 6d., and engine fuel from 5s. 6d. and 6s. to 7s. and 7s. 6d., according to quality. Business in the shipping trade is active; and with a scarcity of steam coal at the ports, prices have hardened slightly—good ordinary qualities being quoted about 11s. per ton, delivered at the ports on the Mersey.

Northern Coal Trade.—The coal trade is active; the limited output at present attained being well taken up. Miners seem now to go in for rather longer holidays; and this lessens the production and allows a decrease to take place in the stocks, so that there is usually briskness afterwards. In the case of best Northumbrian steam coals, the demand is fair, and the price quoted is about 11s. 3d. to 11s. 6d. per ton f.o.b.; unscreened steams being about 10s. 6d., and steam smalls firm at from 5s. 9d. to 6s. Collieries are slowly increasing their output; and this may make prices easier in a few days. The Durham coal trade is brisk; and the demand seems likely to be full for a month or two more. In the gas coal trade, prices are well maintained, though the period of the largest demand is now passing.

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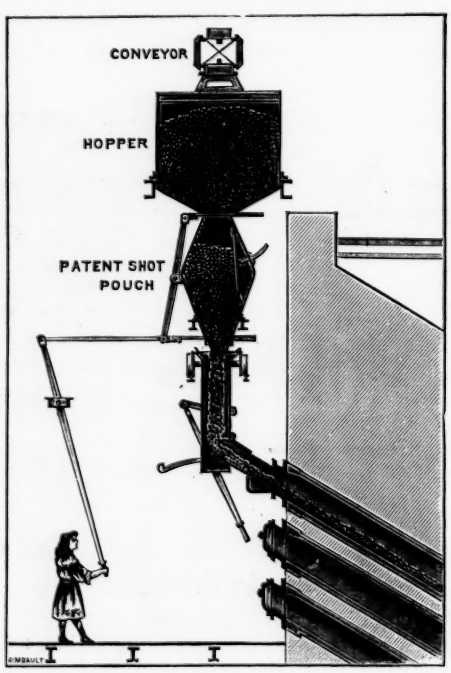

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The production is not yet full, and is well taken up. Best Durham gas coals are from 12s. to 12s. 3d. per ton for immediate delivery; while for forward contracts from 9s. 9d. to 10s. seems to be the quotation, according to quality, and to the length of the contract. Not much, however, is now being sold forward. In coke, best Durham kinds for export are from 18s. to 18s. 6d. per ton f.o.b. Blast-furnace coke is steady at from 16s. 9d. to 17s. per ton free at the Teesside furnaces. Gas coke is plentiful; and the current quotation on Newcastle Exchange is about 13s. per ton f.o.b.

Scotch Coal Trade.—There was no trade of any consequence last week; all the pits being idle. Any business which was done was on the lines of the previous week; the prices being the same. The shipments reported were 204 261 tons—an increase of 8077 tons over the preceding week, and of 16,618 tons over the corresponding week of last year. For the whole year, the shipments were 9,815,572 tons—a decrease of 1,042,694 tons upon the previous year.

St. Helens Water-Works Borrowing Powers.—The St. Helens Town Council have received the sanction of the Local Government Board to the borrowing of £30,000 for the construction of an additional water reservoir at Brown Edge, to hold 10 million gallons. The period of repayment is fixed at 30 years; but the Town Clerk has been instructed to endeavour to obtain an extension of the period.

Whitstable Improvement Bill.—The Bill being promoted in Parliament by the Whitstable Urban District Council, who seek for power to acquire the undertakings of the local Water and Gas Companies, was recently the subject of a public meeting in the town. The proceedings were conducted amid constant interruption; and in the end the resolution in favour of the Bill was declared lost by a large majority. A poll of the ratepayers is to be taken on the subject.

Cost of Opposing the Mond Gas Bill.—Opposing Private Bills in Committee is always expensive; and this expense is most felt when, as in the case of the Mond Bill last session, the opponents do not attain their object. The Oldbury District Council, who appeared against this measure, have been occupying themselves with a discussion as to how the cost can best be defrayed. The bill amounts to the comfortable sum of nearly £1000; and the Gas Committee suggested that payment should be divided between the Gas Department and the public rates. Eventually, the recommendation of the Committee was carried by nine votes to seven.

The Lighting of Langport.—At a recent meeting of the Langport Parish Council, a letter was submitted from Mr. Roberts, of Bridgwater, in response to one from the Chairman and another from the Clerk, intimating his intention of continuing to light the town with gas, although notice had been given to him that, as the contract had been broken by the failure to maintain a supply of gas to the town, the Council intended to light the place with oil. Mr. J. F. Cox moved that the Clerk be instructed to write to the Kitson Lighting Company, asking if they would supply two lamps to the Council for a month on trial, as previously offered; and the motion was carried.

Reduction in Price.—The Gas Committee of the Richmond (Yorks.) Corporation have decided to reduce the price of gas from 5s. to 4s. 2d. per 1000 cubic feet. These rates will be subject to a discount of 10 per cent. to consumers for lighting purposes, and 20 per cent. for cooking.

The South Metropolitan Gas Company and the Supply of Burners.—The wide circulation given by the Press to the remarks made at a recent meeting of the London County Council on the subject of the burners supplied by the South Metropolitan Gas Company under the altered conditions in regard to the illuminating power of their gas, as reported in the "JOURNAL" last week, and especially the advice offered to the consumers to ask for "governor burners," has apparently caused the Company to be inundated with applications for them; for we learn that they are now issuing a printed statement setting forth the fact that the Company are under no obligation to supply these burners, but that they will provide them if they are required at a cost of 6d. each.

East Surrey Water Company.—At an extraordinary general meeting of this Company held recently, it was decided to raise additional capital by the issue of 1400 ordinary "B" shares of £10 each. The Chairman (Sir Frederick Bramwell, Bart., F.R.S.) said those who had followed the course of the Company's business would not be surprised that they were again seeking fresh capital. Having to serve a very large district, they were compelled always to be laying new mains; and the cost of these continual extensions amounted to several thousands of pounds annually. They were establishing new works at Purley, so that they would be ready to give a supply to their increasing number of customers. They were hoping to have the first delivery from the new works at an early date. The shares, as announced elsewhere, are offered for sale by tender, at a minimum price of £16.

Salford and Differential Gas Charges.—A deputation of the Eccles Town Council recently waited on the Gas Committee of the Salford Corporation with reference to the price of gas supplied by the latter to Eccles. At the meeting of the Eccles Council last Thursday, the deputation submitted their report, in which it was stated that Alderman Phillips, Chairman of the Salford Gas Committee, had informed them that they could not consider the question of making any reduction before the end of the financial year. There was, he also said, no intention on the part of Salford to endeavour covertly to obtain from Eccles consumers profits which had been relinquished when the differential charges were abolished. Alderman Mellor remarked that the deputation were met in an extremely friendly spirit, and were told by the Chairman that his Committee were aware that, if they did not give Eccles a sufficiently good and cheap light, the latter could provide it from their own electric plant. They had in hand large stocks of coal, bought at a high price; and until the financial year was over, they could not say whether they would be able to make a reduction. Several speakers thought Salford was making more profit out of the Eccles consumers than was right; but finally the report was adopted.

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Colwyn Bay Gas-Works Purchase.—The Colwyn Bay District Council held a special meeting last Wednesday, at which they affixed their seal to a mortgage of the revenue of the gas undertaking and of district fund and district rate, in favour of the North and South Wales Bank, to secure the sum of £54,000 required for the purchase of the gas-works. A cheque for this amount was then handed over to Mr. W. Earp, the Chairman of the Gas Company, who, with the Directors, attended to complete the transaction. Letters were read from Mr. J. Hepworth and Mr. W. R. Chester (who valued the concern on behalf of the Council) stating that they considered the price fixed a reasonable one. Mr. T. J. Linekar, the Secretary of the Company, has refused a temporary engagement with the Council.

Shipley Gas Transfer.—The great achievement of the District Council during the past year has been the securing of the Shipley Gas, Tramways, and Improvement Act. The chief cause of the Council's action in seeking fresh parliamentary powers was the necessity for the purchase of the undertaking of the Shipley Gas Company. This purchase was completed on Oct. 1, when cheques amounting to nearly a quarter-of-a-million sterling were paid over to the Company. It is generally considered that a very good price has been given for the concern, and that the ratepayers will probably have to wait a considerable time before reaping any material benefit. Hopes are entertained that ultimately the works will become a revenue-producing concern; and with this end in view, efforts are to be made to encourage a much more general use of gas for cooking and other purposes. There is said to be great scope for such enterprise in the district; the Company having seriously neglected this part of their business.

A Horse Killed by Electricity.—As a carriage drawn by two horses was being driven last Tuesday afternoon across the private gravelled carriageway of Mr. Corbet Woodall's house in Fitzjohn's Avenue, Hampstead, one of the horses was killed by an electric shock, and the other was somewhat injured when passing over the spot under which runs the wire conveying the current from the Hampstead Borough Council's main to the house. The wire was disconnected from the main as promptly as possible, and all further danger averted. Happily no one was injured. The Chief Electrical Engineer to the Hampstead Borough Council (Mr. G. H. Cottam) is reported to have explained that the horse was not "electrocuted." He says there was probably a leakage of current, and the horse's iron shoes and nails being wet made the shock greater than it would otherwise have been. It made the animal restive, and caused it to fall beneath its companion, which became also excited, and lashed out with its hoofs in a manner which led to the death of the one underneath.

The Neath Gas Committee, having overdrawn their banking account to the extent of £5000, have decided to accept a loan of this amount from the Cardiff Corporation, at the rate of 3¾ per cent.

The Darlington Town Council have recognized the services of their Gas Engineer (Mr. F. P. Tarratt) by raising his salary by £100 per annum. He is to enjoy two further £50 advances in consecutive years.

We are asked to announce that the past half-year's dividend warrants on the 6 per cent. preference shares and the 4 per cent. debenture stock of the Richmond Gas Stove and Meter Company, Limited, have been posted.

At the meeting of the Spalding Urban District Council on Wednesday last, it was reported that some friction had occurred among the men at the gas-works. The matter has been referred to the Gas Committee to investigate.

By an announcement which appears elsewhere, it will be seen that the Crystal Palace District Gas Company are offering for sale by tender £15,000 of 5 per cent. perpetual debenture stock, at the minimum price of £140 per £100 of stock.

The Directors of the Highland Railway Company have resolved ot adopt for their passenger carriages the Pintsch oil-gas system of lighting. Nearly all of them are at present lighted by oil-lamps; but a few are lighted by electricity, which has not, however, proved satisfactory.

The Electric Light, Power, and Hiring Company, Limited, has been registered with a capital of £15,000, in £1 shares, to carry on the general business of electricians, mechanical engineers, and manufacturers of cables, wires, dynamos, accumulators, meters, generator distributors, fittings, brackets, lamps, &c.

Investors desirous of securing gas and water stock are reminded that the new issues to be offered for sale by Mr. Alfred Richards next Tuesday, at the Mart, will comprise £5000 of ordinary stock of the South Essex Water-Works Company, £5000 of ordinary stock of the Guildford Gas Company, and £10,000 of additional "B" consolidated stock of the Tottenham and Edmonton Gas Company.

The amount of capital which the John Wright and Eagle Range Company, Limited, are employing in their business is largely in excess of the share capital appearing in the balance-sheet, besides which the business is rapidly extending. These points were explained to the shareholders by Mr. E. J. Wright, the Chairman, at a meeting of the shareholders last Thursday; and they therefore agreed to increase the capital to £300,000 by the creation of 77,000 new ordinary shares of £1 each.

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No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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